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SIR WILLIAM O'SHAUGHNESSY BROOKE
FIRST DIRECTOR-GENERAL OF TELEGRAPHS

STORY OF THE INDIAN TELEGRAPHS

A CENTURY OF PROGRESS

by Krishnalal Shridharani

POSTS AND TELEGRAPHS DEPARTMENT

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FOREWORD

A SHORT WHILE ago, we celebrated the Centenary of the Indian Railways and now we are celebrating a hundred years of the Indian Telegraph System.

The telegraph, even more than the railway, brought the new method of rapid communication. (Probably the most remarkable feature of the age we live in is the rapidity of communication.) Starting a little over a hundred years ago with the telegraph, it has spread in many ways—the telephone, the wireless and, lately, radar. Nothing has changed the world more during these hundred years than this astonishing change in our methods of communication. The telegraph was the first great step in this direction. Let us, therefore, honour the telegraph as the herald of the New Age.

A hundred years seem to be a long time, and so perhaps they are. And yet, a hundred years is a moment in the earth's long history and is a brief interval even in the recorded history of mankind. For tens of thousands of years, man's only method of communication was either by runners or, perhaps, by swift horses. In the very early days a genius invented the wheel. For thousands of years it was the wheeled carriage that was the symbol of transport and communication, apart from the horse. No marked progress was made in this direction till the 19th Century was well on its way. Life changed in many ways during these thousands of years, but essentially it did not change. A person living two thousand years ago would have recognised the main features of human existence right up to the middle almost of the 19th Century.

Then came the great change heralded by the railway and the telegraph which has progressively altered the very texture of human life. Therefore, in celebrating a hundred years of the telegraph in India, we celebrate something that has been the essence of this new world that we live in and which changes continuously because of the progress in science and its application. If we are to understand this new world, we have to worship at the shrine of science, though that need not be our sole worship, for we require other things also to have a balanced and integrated view of life.

The Indian Telegraph and Postal System is a great public undertaking. I am told that it is the oldest government-owned public utility in the world. We can well be proud of it. But we cannot rest content with what has been done, or else we fall back.

When we think of the Telegraph and Postal System in India, let us think of the hundreds of thousands of our countrymen who run this system. Above all, let us think of the telegraph messenger and the postman who do this work from the heights of the Himalayas to the vast plains below. It is on this stable foundation as well as the super-structure of science and technology that this system rests. We must always remember that the well-being of all these workers of all grades in our Telegraph and Postal System must be our special care.

Jawaharlal Nehru

NEW DELHI;
September 9, 1953.

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INTRODUCTION

"A CENTURY OF PROGRESS" is an apt sub-title for a book dealing with the history of the Indian Telegraph System, and of its sister services of Telephone and Wireless. The hundred-year record is such as to give every citizen of India a sense of pride. But we cannot rest on our laurels, and this festive occasion is precisely the moment to re-dedicate ourselves to the task of taking 'the carriers of democracy', the telegraph and telephone lines, more and more to the rural areas.

As we look with pride to the first hundred years of the Indian Telegraph System, we look with confidence to the coming century. In fact, I would like to be more concrete and confine myself to what we are determined to carry out by the end of 1956. Our slogans under the Five-Year Plan are 'Expansion' and 'Modernisation', especially in the Telephone branch whose progress has not been as spectacular as that of the Indian Telegraph. Rs 48 crores are earmarked for capital outlay. We have already opened a post-office in every village with a population of 2,000 or more. We hope to cover the country with a network of post offices in such a way that no place will be at a distance longer than three miles from a post office. More germane to this volume, we intend to open a telegraph office in every taluka and police headquarters and in every place with a population of 5,000 or more, will have a Telephone Exchange by the end of 1956. A large number of Public Call Offices are also to be opened. What is equally essential, our Five-Year Plan includes provision for the welfare of the vast number of workers in the Post and Telegraph Department—roofs over their heads, better uniforms, medical facilities, canteens, clubs, co-operatives and playgrounds for their children.

It is the performance of the Indian Telegraph System during the century now ending that gives us assurance that our plans will not remain paper plans and that our targets will be met. What is that record? In what ways is the Indian Telegraph System distinct in a field which is now well-nigh universal? I would like to focus the attention of the reader to some of the points made by Dr Krishnalal Shridharani in his admirable study.

The Indian Posts and Telegraphs is the oldest Government-owned public utility in the world. This point has a special significance for us in India because we have adopted for the present a mixed economy and our ideal is a welfare state. We are seeking the upsurge of the service motive. The competence of 'bureaucrats' in running vast enterprises is still debated. The record of the Indian Telegraph should inspire confidence, I think, in the ability of the State to supplement and complement private enterprise.

The Indian Posts and Telegraphs Department is the second largest aggregate of public utilities in India. It is thus a unit of the Government of India which employs the second largest number of Indian citizens. International experts have admitted that India's is one of the most difficult terrains in the world for the construction of communication lines. We have to scale the snows of the Himalayas—we maintain the highest line in the world at Khambajong in Sikkim. Our officers and men penetrated the dense tropical jungles of Assam and Burma, often acting as soldiers in self-defence against hostile tribes and wild animals and venomous reptiles. Some of them died in the line of their duty. Vast areas in Assam, Orissa, Madhya Pradesh and Himachal Pradesh still remain to be connected with telegraph lines. These are difficult and impassable in jungle and hill areas. But our brave men are engaged in linking these areas with the rest of the world. I would like to take this occasion to pay my personal tribute to the officers and men, especially to the men of what is called 'lower grade', of the Department for the heroism they have displayed and are still displaying in constructing a network over a country that is like a continent.

The sociological significance of the communications network cannot be over-emphasised in any country, especially in India. In a country of regional, caste, religious and linguistic overtones, communication lines weave iron bonds of unity. The beginnings of the telegraph in India a hundred years ago electrified the sense of nationhood and the ever-extending lines have since been deepening that feeling. The future of communications in India, therefore, lies not only in making all Indian citizens more comfortable and informed, but also in making them more vital representatives of what is generally called, for want of a better expression, the Indian genius.

JAGJIVAN RAM

ACKNOWLEDGMENTS

THE TELLER of the Story of the Telegraph, encompassing the first century of progress of the oldest Government-owned public utility in India, and perhaps in the world, has to blaze his own trails. There are no books, no sustained studies, and the writer is forced, most fortunately for him, to repair to the recollections of old-timers, to the meticulously kept Departmental Reports, to the wealth of the Government Archives, to the files of the Asiatic Society of Bengal, and to old, crusty, crumbling pages of newspapers. For the basic, primary research, the teller of this tale is grateful to the Additional Chief Engineer's Office at Jubbulpore and to Mr S. Krishnan in particular. Gratitude is due to Mr Sudhir K. Kanjilal, Officer on Special Duty, for paragraph to paragraph, page to page, criticism and technical guidance. Mr. Jagdish Prasad, Deputy Chief Engineer, has gone minutely through the manuscript and made helpful suggestions. So has Mr K. V. Pai, the Controller of Telegraph Traffic. After all, the reconstructor of this mighty Indian adventure cannot claim to be a technical expert and so he has been lucky to have such departmental heads as Messrs B. R. Batra and S. P. Patel, to volunteer points and to check and double check the facts. For overall guidance on policy matters and for constant encouragement, the writer is indebted to Mr Jagjivan Ram, Minister for Communications, to Mr Raj Bahadur, Deputy Minister for Communications, to Mr Krishna Prasada, the late Director-General of Posts and Telegraphs, and to Mr H. L. Jerath who has just assumed the office.

I. Pioneers and Politics

AS ONE MOTORS from Agra to Shalimar in Shrinagar, one sees by the roadside, at a distance, a series of masonry heaps or half-columns. Those used to be pillars atop which drummers sat to send advance messages regarding the progress of Jahangir's and Nurjahan's party proceeding from the Red Fort to the garden of their desire. Jahangir's India had no electric telegraphy; no country in the world had it at that time; and so the slight refinement of the jungle drum served the purpose.

FROM DRUM BEATS

Before the invention of the telegraph, communication was transportation itself. Either you journeyed yourself in order to contact a relative or a business associate, or somebody else travelled on your behalf in order to deliver your epistle. Later carrier pigeons, beacons, smoke signals and flags were substituted to communicate messages over short distances.

Communications of any kind in India were in their infancy when Dr O'Shaughnessy started a little over the 'official century', to experiment with his telegraph wires. Even post was exchanged by couriers along few main roads connecting principal provincial towns with the seat of the Government in Calcutta and they were 'reserved for official letters and parcels', only on rare occasions private individuals being given the 'privilege' to use them. Each province had its separate system of control and operation and of postal rates, and there was no central authority to impose uniformity of procedure or of the charges for the conveyance of messages. Cash was demanded because there were no postage stamps, often accompanied by additional cash to grease the palm. It was in the Telegraph Department that the first organised process of communication dawned in India.

Communication only slightly faster than post was by means of semaphore signalling and that too between few places. Pillars 18 ft square and 30 ft

high were constructed at 20-mile intervals and the signals by means of a rotating triangle were read by telescopes. This 'telegraph' was working between Calcutta and Chunar on one side and Calcutta and Sauger on the other. No public messages were carried over this 'telegraph' which was started in 1813 and continued off and on till the 'Electric Telegraphs' were introduced.

LONG-DISTANCE NEIGHBOURS

The revolution wrought by the invention of electric telegraph, to be followed by telephone, is only too obvious. Risks in trade dwindled, because buyers and sellers could keep track of prices from hour to hour. Even railroads depended upon a faster mode of communication than its own steam engine, because its own run had to be preceded by messages as to its arrivals and departures. Telegraph and telephone made large corporations possible and thus played their part in the rise of modern industrial civilisation. The modern newspaper, as we know it, is almost exclusively the child of telegraph and telephone. Modern warfare, is crucially dependent on telegraph, telephone and wireless.

The whole concept of neighbourhood changed. Contacts became a matter of choice rather than of proximity. In a large country like India, national integration and the rise of common culture were speeded up by telegraph, telephone and railways. If we still retain sharp local variations, it is because our culture is far older than the modern means of communication; American culture is relatively more standardised because telegraph poles travelled with the pioneers in search of new frontiers. And yet nationhood in its modern sense that we have achieved is in no small measure due to the beginnings made in Calcutta by one Dr O'Shaughnessy, later to be supplemented by such Indian associates as Seebchunder Nundy who utilised such typical Indian materials as 'bamboo scissors' and toddy palm trunks when the present-day Hamilton poles were a far-off dream.

TOWARD DIAMOND HARBOUR

Half the way across the world, thousands of miles apart, the first experimental telegraph lines were constructed in India and America, the oldest country and the most modern, in the same year—1839. The pioneer in India was Sir William O'Shaughnessy Brooke, fondly remembered as 'Dr O'Shaughnessy'.

His American contemporary was none other than the father of modern electric telegraph, Samuel F. B. Morse. Samuel Morse connected Washington, D.C., with Baltimore in 1839 over a stretch of some 40 miles. Dr O'Shaughnessy completed some 21 miles of telegraph line in 1839, proceeding from Calcutta in the general direction of Diamond Harbour, and negotiating a river crossing of 7,000 yards. Thus started the story of an Indian adventure which was to keep pace with technological developments in the most advanced countries of the world.

However, the historic march from Calcutta to Diamond Harbour was preceded by modest, local experiments. W. B. O'Shaughnessy, 'M.D., Assistant Surgeon, Professor of Chemistry, Medical College, Calcutta, and Officiating Joint Secretary to the Asiatic Society of Bengal,' himself recorded his experiences in *Calcutta Bishop's College Press,* 1839. 'I accidentally found too (by the falling of a wire into the large tank at the Medical College)', recorded Dr O'Shaughnessy, 'that when water was available, only one insulated wire was requisite for completing communications.....and although I find the fact has also attracted the attention of Professors Henry and Steinheils, these philosophers will, I feel convinced, learn with interest the simultaneous pursuit of the like object, in my humble investigations.'

He was still talking of his experiments on the communication of telegraph signals by electricity. In one experiment, the electromagnetic machine was stationed 'at the ghat of the Bishop's College, and one of its wires but twenty-five feet long, dipped in the Hooghly at the Ghat. The second wire ran along the dry path round through the Botanic Gardens and terminated in Dr Wallich's Library. A wire led from the river at the ghat before Dr. Wallich's house also into the Library. The Assistant stationed at the machine was directed to make the signals in the usual manner. Every signal told in the library without any notable diminution in effect.' The second set of trials was at Sir John Royd's Garden, 9,700 feet of water distance intervening.

In a third trial, 'seven miles of wire were disposed round the trees of the garden, taking in its entire boundary, starting from Dr Wallich's house and terminating in the river at Howrah, a second wire was carried from the river, at the west-end of the Garden (two miles of the Hooghly being interposed and proceeded to the north extremity of a Nullah 3,000 feet in length; from the south-end of the Nullah a wire returned to the Library. Thus we

had altogether eleven miles of metallic and 13,256 feet of water circuit, the latter in two interruptions. The signal still passed as intelligently and strongly as before.' And building up his claim as a telegraph pioneer, he concluded: 'To effect a perfect system of telegraphic communication for a distance, say of 500 miles, two wires are at most required; where a river passes between the termini, but one wire is necessary.' Of course he was slightly wrong about his 'water theory,' as later researches proved; but at that time he was in the vanguard.

It was also in the year 1839 that Maharaja Ranjit Singh died, prefacing in such a mortal way the tottering of the once mighty Sikh challenge to the British rule. The steamroller of the Company Rule was flattening, one by one, the remaining pockets of resistance. Tipu Sultan of Mysore was vanquished in 1819, and the Marathas were held at bay just as the Sikhs were stopped in their tracks. Wellesley's policy of annexing to the Company Rule any Princely State whose ruler died and whose succession was in dispute was being speeded up during this period, especially after 1848 when Dalhousie landed in Calcutta as the Governor-General. The British were feeling their strength and preparing to strike south-east, at Burma, now that the Sikh Empire in the north-west was sinking. They had enough time to pause, to take stock, in order to consolidate their gains by knitting together far-flung areas to the nerve-centre of Calcutta through the construction of telegraph lines.

The Board of Directors of the East India Company, sitting in distant London, sanctioned in 1850, by which time telegraphy had made marked progress in Europe, the construction of a line between Calcutta and Diamond Harbour, a distance previously traversed incompletely and 'unofficially' by Dr O'Shaughnessy. The work started on 5th November, 1850, and by the October next year the 30-mile distance was successfully covered. The first telegraph line in India was opened for traffic in 1851, although primarily for official use. Thus began the story of the oldest Government-owned public utility in India, and perhaps in the world. Another analogy which illustrates the fact how India has kept abreast of times in telegraphy; it was also in the year 1851 that what is now known as the Western Union was founded in America; the Western Union is to this day a private enterprise, while the Indian Telegraph is owned by the community for the community. Other important starting points from which differently-ending centuries of progress can be

counted, are: 1853, the end of the experimental stage and the beginning of large-scale construction; 1855, when telegraph thrown open to public traffic.

THE OLDEST GOVERNMENT MONOPOLY

From its very inception, Indian telegraph, unlike the telephone or the railway, has been the exclusive monopoly of the Government, for long years run at a loss with a view that the public should have the even benefits of the art of sign transmission over long distances through the means of electricity; governmental monopoly over even the postal system was to follow. A monopoly implies unified or concerted discretional control of the price at which purchasers in general can obtain a commodity or service. A monopoly can be a potent source of fleecing the public. But when a monopoly is Governmental, implying common ownership over a group of goods and services indispensible to the community, it is generally operated in the interest of society and often at a loss. Governments have often acquired direct ownership of projects of great moment to the community welfare but for which private capital is not readily available. The tendency, however, to fill the gap created by scarcity of private capital, wherein government ownership may be little more than a method of guaranteeing security to foreign capital, is not wholly laudable. In India (as in Australia) luckily a sense of service to the people existed in the formation of government monopolies; and such daring beginnings in the second half of the 19th century have been responsible for greater nationalisation of economic activities in India than in the United States. The Indian telegraph is an example, although in the case of the railway, the idea of underwriting a fixed return for foreign investors was perhaps present in the British mind.

In the case of telegraph systems, now almost every country of importance in the world, with the exception of the United States, Venezuela and Ecuador, is wedded to government ownership and operation, while government monopoly in the field of telephone is only slightly less widespread. But when India took the lead in the year whose 100th anniversary we are celebrating currently, it was an imaginative and an unprecedented move, so much so, that we find the following editorial on the first Electric Telegraph Act, presumably written by an Englishman, in *the Bombay Times and Journal of Commerce* of January 17, 1855:

'There is one very important point upon which India is in advance

of England. At home, thinkers appear wholly undecided as to the line which ought to divide public works from private enterprise. While one party clamours for state grants to picture gallaries, and state control over sanitary measures, the other would leave even railways without any state responsibility. The Legislature by turns obeys both principles, passes Ten Hours' Bill, and refuses Mr. Cardwell's scheme, orders London builders to follow a bad model, and leaves the monopoly of the Telegraph to private Companies. In India we have advanced beyond this stage. Right or wrong we appear to be acting on a principle, which may be thus rigidly defined. Wherever the interests of the proprietor cannot seriously clash with those of the people, he is left to himself. Wherever they may so clash he is placed under State control. Thus no one dreams of controlling the Assam Tea Company, or the owners of the Bonded Warehouse. If they charge too much for tea or house room, or if they close their establishments altogether, it is only themselves who suffer. The drunkenness of their agents injures only the employers. Yet we control Railways, because the folly of Directors, the drunkenness of a guard, or the carelessness of a pointsman may endanger public safety.

'It is on the same principle that we uphold the Telegraph Act published on the 27th December. In that Act, the Government claims for itself, at present the monopoly, and for the future the most stringent control over all Telegraphs in India. No one can make a Telegraph without a license and even when licensed it may be at any time suspended by a resolution in Council. To a rabid General Vestryman there may seem no reason why we should not build his telegraph, as well as drive his gig, wherever he pleases. The restrictive policy is, however, sound. The Telegraph stands on the footing of the Post Office. Wherever it is set up it becomes the most perfect means of communication, it modifies the arrangements of trade, and influences every feature of society. That such an engine should remain in private hands is repugnant to the instinctive commonsense of mankind. No individual can be allowed to derange at his own pleasure the machinery of nation-

al communication. It may be said that the enlightened self-interest of the proprietors will prevent any injury to the public. The simple answer is, that it does not do it. In England the enlightened self interest of half a dozen men leads them in the first place to charge as much as they can get. Every additional penny a word deprives some additional grade of society of a privilege, now becoming almost as necessary as free speech. It may be, as it was on Tenth April, a matter of national importance to check communication. The proprietor of course, unless very patriotic,—and Companies have no patriotism, will send the message, or refuse it, according to the pay.'

THAT MAN O'SHAUGHNESSY

It was natural for the East India Company in London, and its supreme representative, Governor-General, in Calcutta, when they finally resolved in 1850 to erect the first telegraph line in India linking Calcutta with Diamond Harbour, to turn to 'that man O'Shaughnessy' who had, all on his own, constructed a 21-mile long line only eleven years previously. This commission was given on the basis of the international fame he had earned as an innovator in the field of electric telegraph, being talked of along with such illustrious names as Morse, Wheatstone, Henry and Coke. As early as 1837, O'Shaughnessy had declared 'the electric telegraph to be a possible thing' and actually proved it in 1839, at the age of 29, by constructing a 21-mile long line.

This thrice-married man, who later became *Sir* William O'Shaughnessy Brooke, was born at Limerick, Ireland, in 1809. After taking his degree in Medicine at the Edinburgh University, he entered the service of the East India Company and his wander-lust was appeased when he was posted to Calcutta around 1839. For four years he served as Professor of Chemistry in the Medical College. The 'Doctor' was also appointed to hold charge of the Calcutta Mint; a small number of Britishers had to govern a large number of unwilling Indians and so they had to possess versatile proclivities and be jacks of many trades. He was 'confirmed' as a Surgeon in 1848.

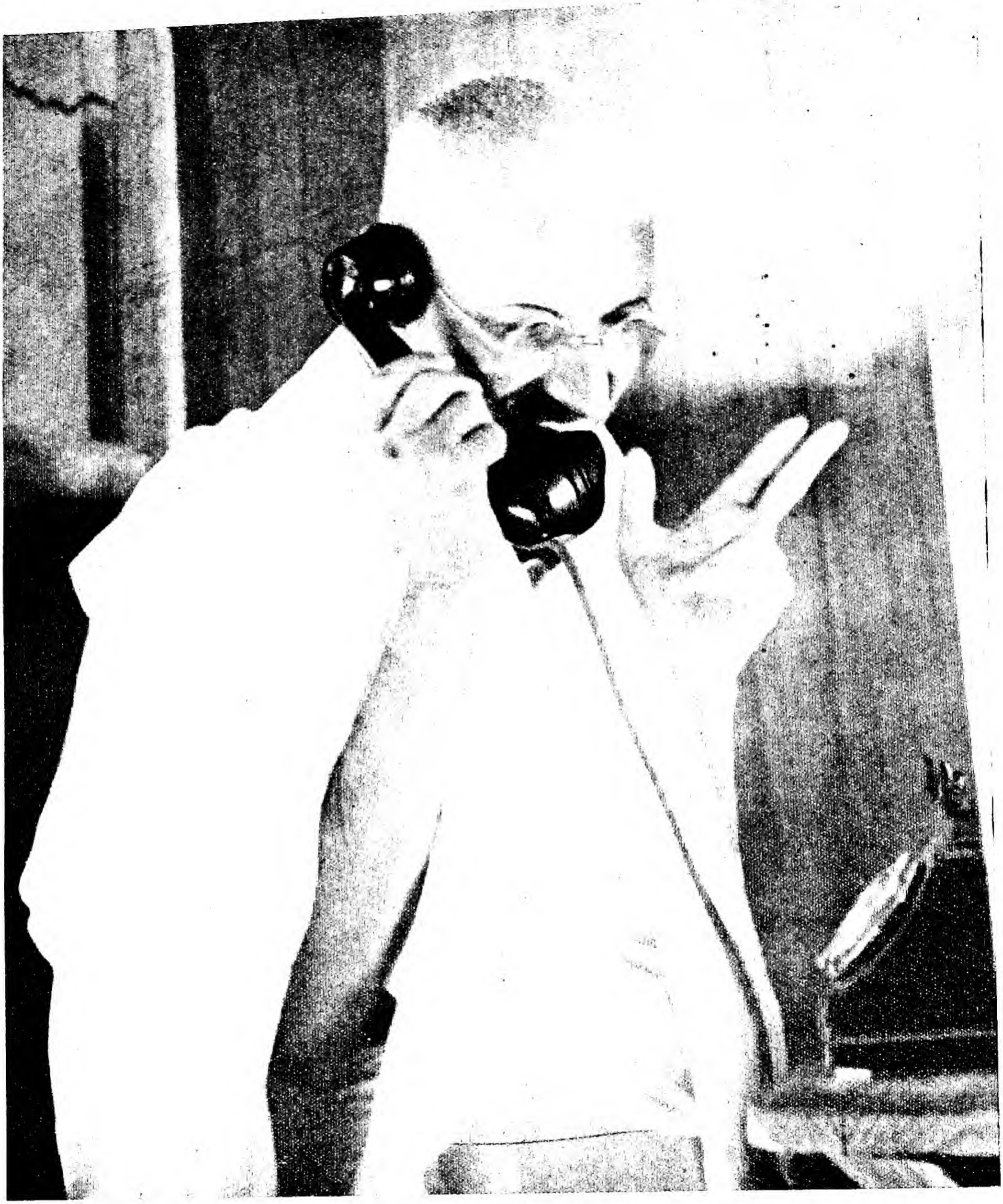
The Military Board was shrewdly watching the 'Chemical Engineer at the Mint'. The Secretary of the Military Board requested O'Shaughnessy in 1849 to 'examine and report on the possibility of introducing electric

telegraph in India'. Besides writing prolifically about his 'experiments' in the *Journal of the Asiatic Society of Bengal,* he completed his report to the Military Board in December 1849, taking exactly a month.

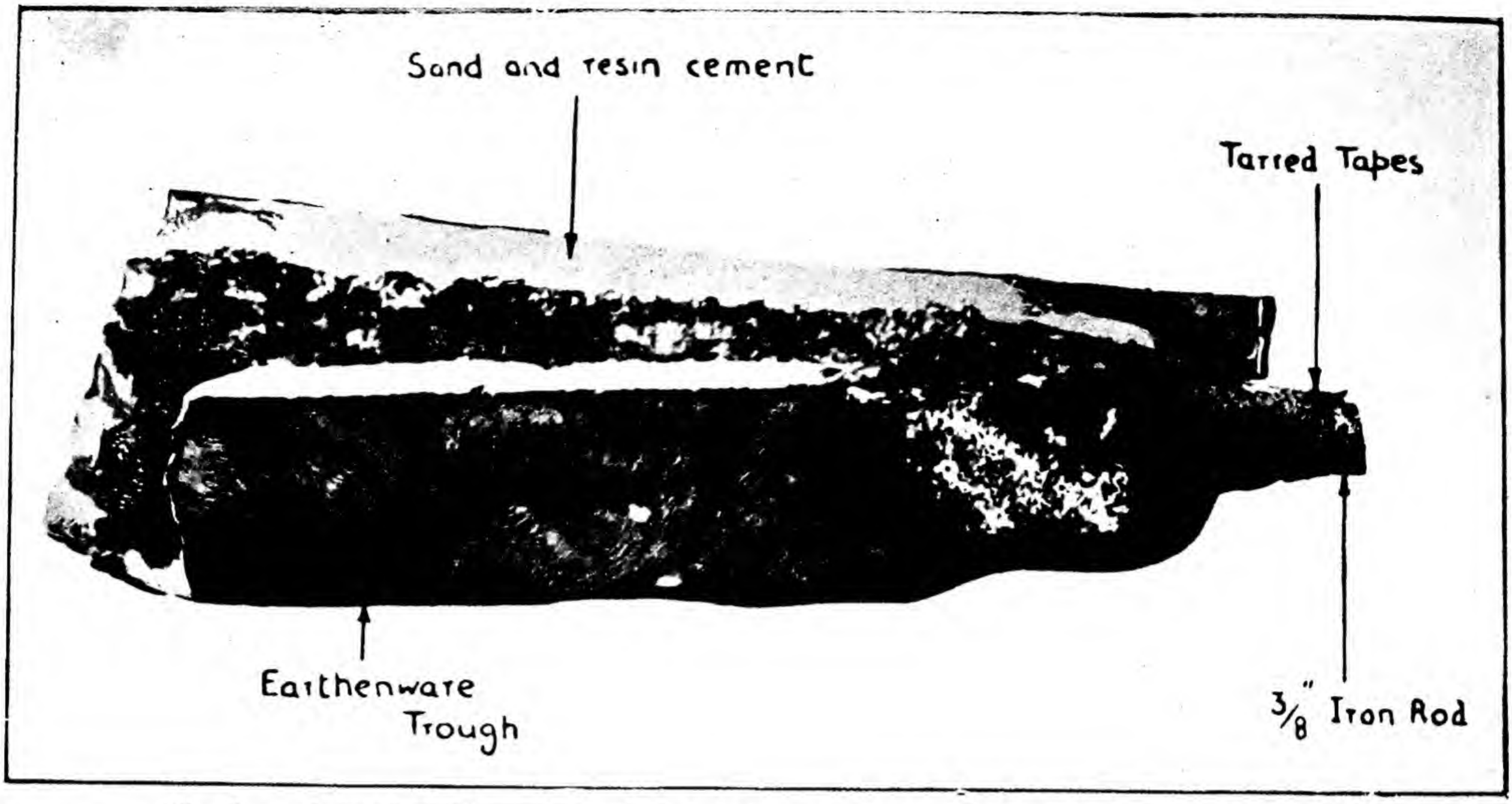
Fortunately for O'Shaughnessy, and for telegraphy in India, a man of many-faced and warm venturesome nature was at the helm of the Company's affairs. At the age of 36 and on January 12, 1848, Marquis of Dalhousie had been sworn-in as the Governor-General. One of the most controversial figures in history, and blamed by some scholars as the major provoker of the so-called Sepoy Mutiny (the First Indian War of Independence) because of his buoyant policy of annexing one Indian State after another to the Company's rule under the Doctrine of Lapse, he was nonetheless destined to go down in history as the author of certain famous reforms and industrial projects. He had a period of grace and respite as a conqueror. The Marathas were stopped in 1818, and the Battles of Sutlej had broken the Sikh power. He initiated an Act sanctioning the remarriage of Hindu widows; he took special measures to combat the Thugs (dacoits); he instituted trial by jury. By establishing the Public Works Department both for irrigation and communication, he set India on the path of State enterprise and research. It was around this time 'favoured by the gods' that the first cotton mill was set up on Indian soil, to be followed later by the growth of the tea industry, coal mining and jute mills. And before he introduced the railway to India and reorganised the postal service, he encouraged O'Shaughnessy to start one of the earliest telegraph lines in the world. The Company's sanction came in March, 1850.

Under State recognition, O'Shaughnessy supervised with 'ability, experience and energy' the first experimental line between Calcutta and Chinsurah, one half of which was underground and the other half aerial, as the controversy between the relative merits of 'over-ground' and 'below-ground' was still raging in the scientific world. The lines from Calcutta to Diamond Harbour (30 miles). Bishtapore to Mayapore (11 miles), and Kukrahata to Kedgeree (25 miles) were constructed in quick succession and the fact that it was possible to maintain uninterrupted communication even during the 'furious hurricane of the 23rd and 24th October, 1851' was taken as sufficient proof of the efficiency of the lines put up by the 'Doctor'. Commented the *Bombay Times and Journal of Commerce* on October 18, 1851:

'According to all accounts the contrivances devised by



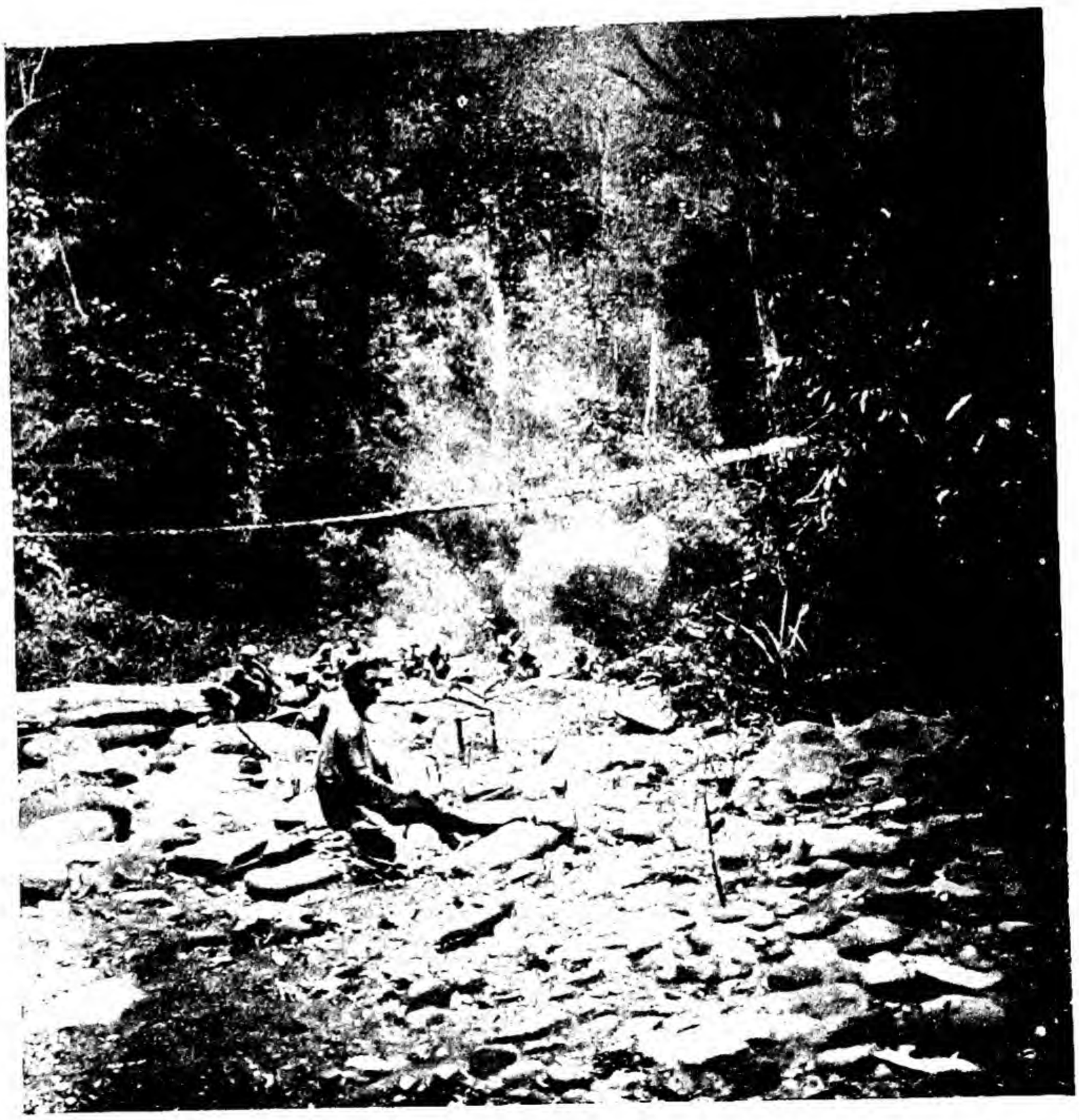
Mahatma Gandhi in his Wardha Ashram experimenting on Village Self-Sufficiency. Independent of machines, he made two exceptions for himself ; a telephone and a watch



The first telegraph cable used in 1851 for the line between Calcutta & Diamond Harbour

The New & Old—The granite pillar alignment was erected 100 years back—the latest in overhead line is on the left

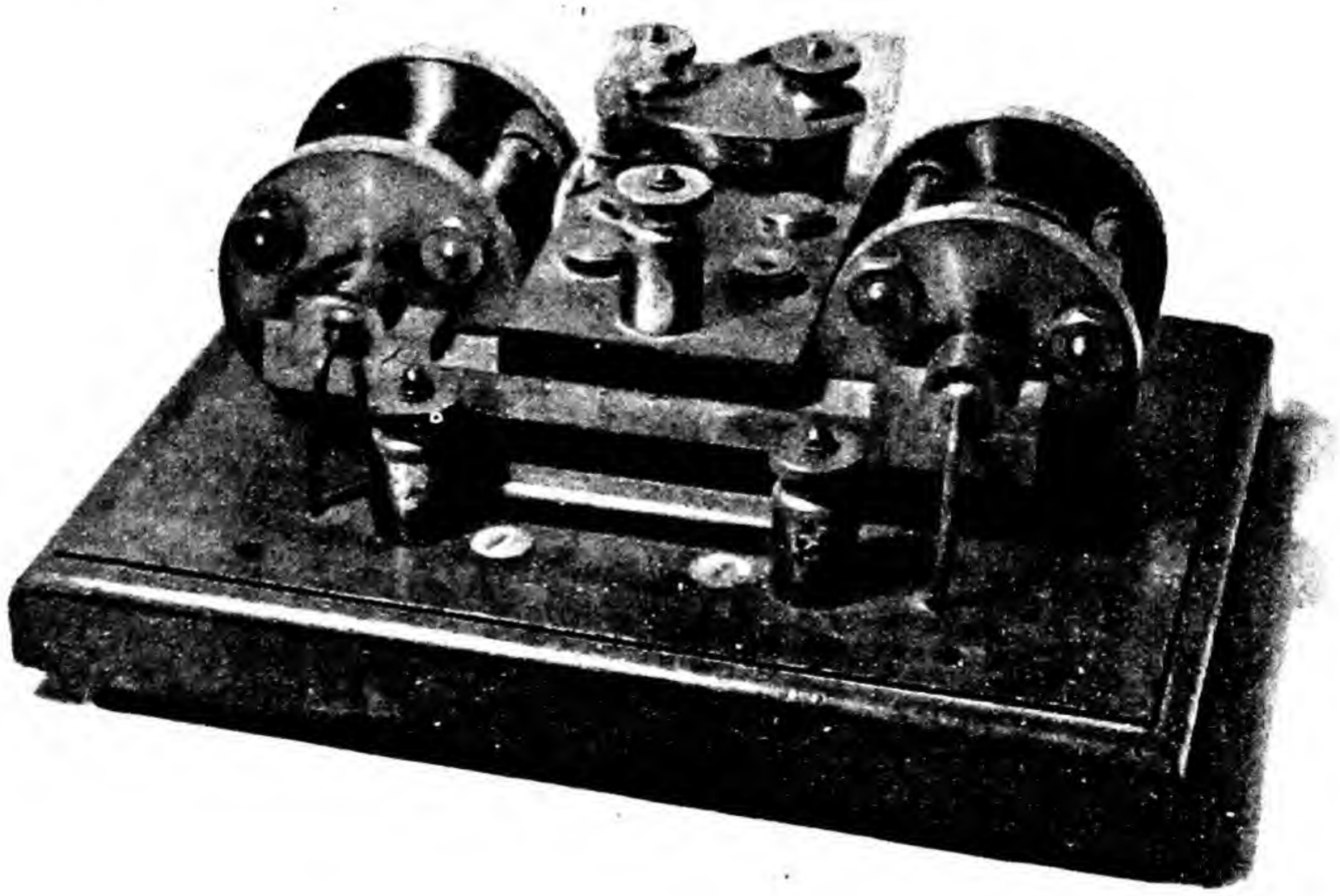
A telegraph suspension bridge on the Assam-Burma border constructed out of telegraph material and wooden planks used for movement of line maintenance staff

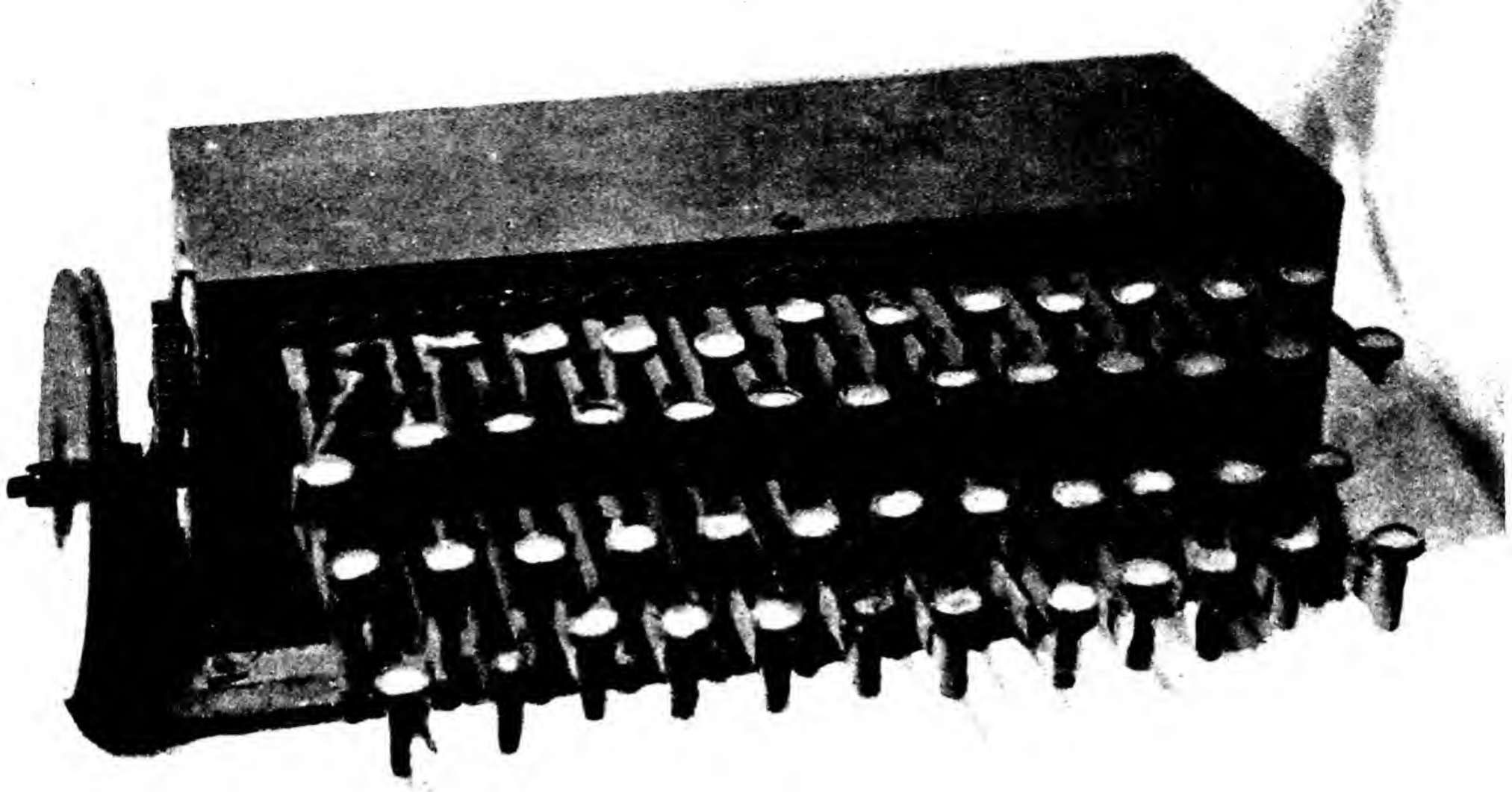


Well earned rest—A telegraph maintenance party in the jungles of Assam resting after their labours. The suspension bridge under construction by the party can be seen in the background

Wheatstone tape perforator used in early days of high speed telegraph system (1910)

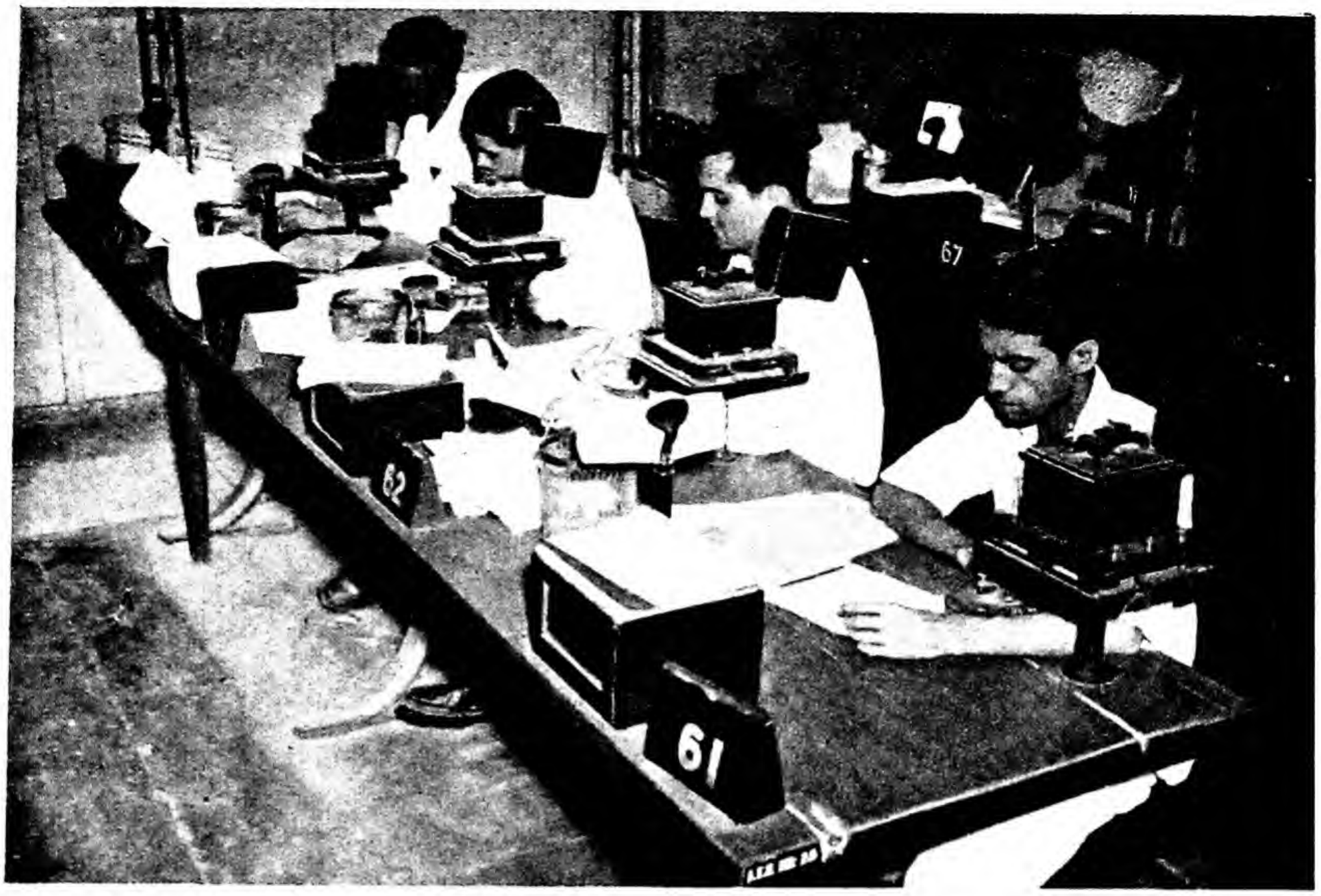
An obsolete pattern of lightning discharger used for protection of cables (1870—90)





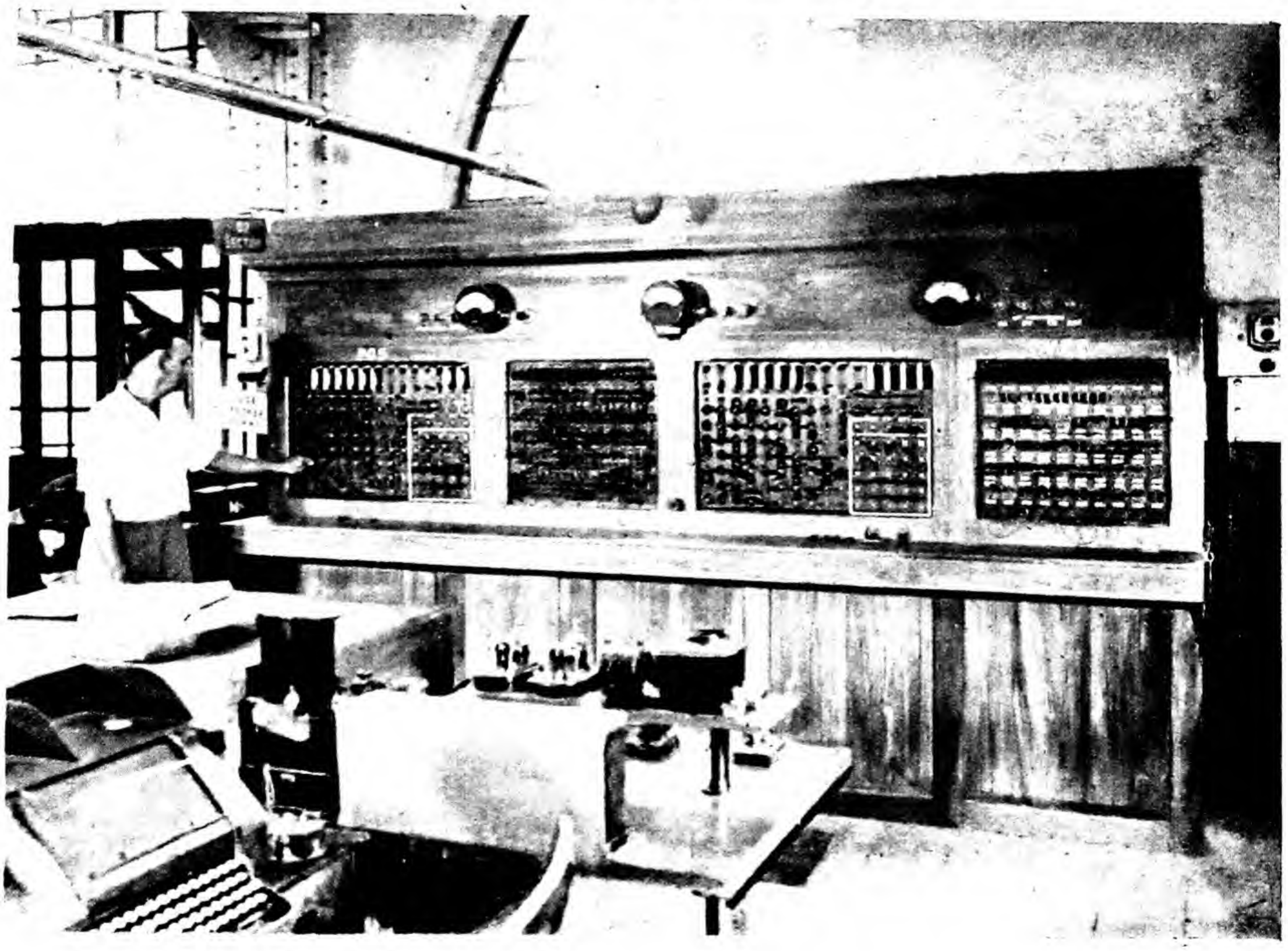
A telegraph key-board and instrument used in the early days of machine telegraphy (1900 1910)

Instrument room of a large telegraph office (Delhi C. T. O.) showing Telegraph Signallers at work



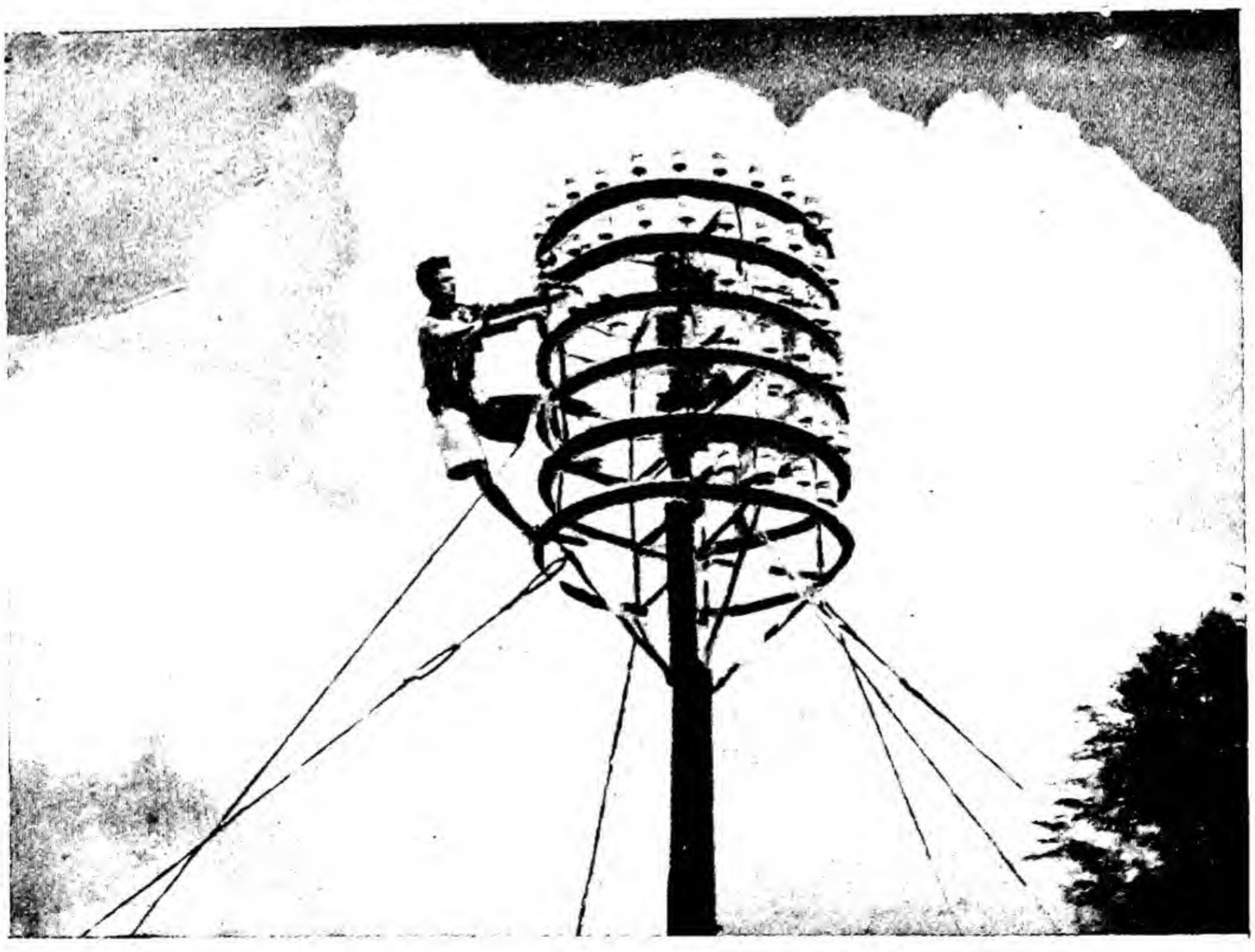
Instrument room of a large telegraph office (Delhi C.T.O.) showing Telegraph Signallers at work

Telegraph commutator, Madras C.T.O.



Seeb Chunder Nandy. The first Indian officer in the Telegraph Dept. (B. 1824, D. 1903)

A terminal post using circular brackets



Shri Jagjivan Ram, Minister for Communications, Government of India, Inaugurating Calcutta-London direct wireless telegraph service: March 12, 1953.

No delay—a team of despatch riders ready to deliver telegrams—system of despatch riders introduced in 1949-50

Dr O'Shaughnessy in insulating the wires and protecting them have proved eminently successful, and there is no reason to doubt that the junction of Diamond Harbour with Kedgeree, and continuation of the line further seaward will be triumphantly effected, though the difficulties to be surmounted are not of ordinary character. Considering the influence of pomp upon the native* mind and the important character of the undertaking completed, we hope the formal inauguration of the Telegraph will be commemorated with at least as much ceremony as the opening of a female school, or the distribution of prizes at the college.'

Crowned with success over the first experimental telegraph line, he was deputed by Lord Dalhousie to go to England in order to explain to the Court of Directors the implications of the various schemes he had about constructing lines from Cálcutta to Agra, Bombay, Peshawar and Madras. On his return from England, he was formally appointed 'Superintendent of Electric Telegraph in India,' a position he had virtually been holding since the beginning of 1851. The post of Director General of Telegraphs was for the first time created in 1857. Dr O'Shaughnessy was the natural choice.

He was deeply interested in other branches of science. For instance, he contributed to the *Journal of the Royal Asiatic Society of Bengal* on such subjects as: The detection of Arsenical poison; Indian hemp and its effect on the animal system and its utility in the treatment of tetanus and other convulsive diseases; Explosions of gunpowder under water by Galvanic battery; Explosive cotton. His attempts to pass messages across a broad river, using water as the sole conductor, his experiments with the galvanoscope, etc., were indicative of the inventive spirit which pervaded all his

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*The word 'Native' was still a description and not an epithet. During freedom's battle under Gandhiji, India developed a strong aversion to the term, because the British were by then using it not in the proud Western sense but in order to denote Kipling's 'lesser breeds'. Since Independence India has virtually banned the use of the word to describe non-European, non-American peoples. But while reconstructing history, the term has to be reproduced 'in order to' retain the tang of the time. With the same aim in view such words as 'Native States', 'Empire', 'hands', are also retained.

activities. And his brilliant record on the Indian soil suggests two generalisations. (1) Although at the commencement of the modernisation and industrialisation of India Englishmen took the lead, their outlook had become Indianised in that their inspiration sprang from India's needs and India's conditions, and they were to be increasingly associated with Indian talent finally to be superseded by the sons of the soil. (2) And although India lagged behind Europe and America in basic scientific discoveries in modern times, such histories as that of the Indian Telegraph shows that adoption and modification with Indian conditions in view, requiring another kind of inventiveness, rather than pure imitation, has been the rule, highlighted by the construction and manufacture of several instruments in Indian laboratories and workshops.

Dr O'Shaughnessy may rightly be regarded as the father of Electric Telegraph in India, though his contribution to the science of telegraphy as such may not be of abiding interest. He was essentially a man of action, and no greater tribute can be paid to him than by inscribing on his grave the map of the mighty telegraphic network in India as it obtained in the year 1951, a full century after his lion-hearted beginning.

In recognition of the services rendered by him, he was awarded a Knighthood in 1856; was made a Fellow of the Royal Society in 1859; in January 1860 he was confirmed in the rank of Surgeon Major. In the June of the same year he left for England on furlough and retired from service the next year. The pioneering voyager died at South-sea on the 8th of January, 1889.

OF MONKEYS AND MAN-EATERS

The length of the first telegraph line erected in 1851 was not impressive, but the difficulties surmounted were of giant proportions. The low lying delta of the 'Ganges' was exposed to violent storms and electrical disturbances. The Hugli was a broad and rapid stream, a waterway of congested navigation to Calcutta, ever shifting its course. This was long before the days of steam, and under-water telegraph cables were liable to be tangled up in anchors of sailing ships and fishing boats.

Difficulties were not only of different kinds, but some of them those that only India could offer. Edwin Arnold, writing at a much later date, gave poetic expression to the troubles of India's telegraph pioneers. The builder of the Indian telegraph, he wrote, 'had a field for experiment, subject

to electric storms and perturbations unknown in Europe: a soil alternately baked into one electrical condition, and sodden into another; winds that would lay the telegraph posts in England across the lines from Birmingham to London in a night; little timber, less iron, no skilled labour, no appliances at starting, and the white ant. The ground which he selected to begin upon on the principle of measuring difficulty by its maximum, was alike from June to December, and a wilderness of fissured clay from December to June..... His posts had to pass through jungles, where wild beasts used them for scratching-stations, and savages stole them for firewood and rafters for huts. Inquisitive monkeys spoiled the work by dragging the lines into festoons, or dangling an ill-conducting tail from wire to wire. Crows, kites and fishing eagles made roosting-places of the lines in numbers so great as to bring them to the ground; though once or twice a flash of lightning, striking a wet wire, would strew the ground with the carcasses of the feathered trespassers by dozens. The white ant nibbled galleries in the posts, and the porcupine and bandicoot burrowed under them.'

Much later on, when telegraph lines were extended through the tropical, lush jungles of Assam and Burma, construction parties looked like expeditionary forces, operating under alertness approximating army discipline, carrying not only their technical instruments but also firearms to be used against man-eaters and hostile tribes. Although the railway used contractors, the Telegraph Department always depended on its own work parties, and so the history of telegraph in India is replete with instances of heroism and ingenuity, especially at the lower staff level. That man can be more dangerous than the man-eater became the experience of telegraph line constructors when they reached the North-west Frontier. A shiny brass button was considered worth taking a life there. The hollow telegraph post, conducting a humming sound, never failed to attract the inquisitive Afridi. He would put his ear to the pole, take his shoe off, and striking the post with his shoe, fully expect his message to be conveyed to the next village.

'SIBU NANDY LANE'

During the second half of the 19th century the representatives of the East India Company were still occupied with the task of consolidating British hold on India. The focus of all their activities was military. Lines of communications and transport which they developed represented the topography

of the military mind. Naturally they were suspicious of Indians because they had to rule over an unwilling people. They used Indian nationals only in menial and clerical positions. It was seldom that the native gifts of an Indian were given full scope. In the army of course, thousands of Indians were recruited as ordinary soldiers, but few attained officers' ranks.

Yet, at the birth of telegraphy in India, British attitude towards Indian participation in constructive work had not irrevocably hardened; a deliberate policy to exclude Indians from any work remotely connected with defence was to come during and after the so-called Mutiny. The idea that all crucial positions even in post, telegraph and railway departments should be reserved preferably for Englishmen and secondarily for Anglo-Indians had not struck roots yet. We see the Board of Directors, East India Company, London, expressing themselves to the Governor General of India in Council on 16th July 1856: 'We are desirous that continued efforts should be made to qualify Natives to undertake the duties which in so many instances have to be performed by European agencies.' There was the pre-Mutiny British mind, still partly open to the peoples of occupied areas. The same official letter takes note of the fact that according to a communication from the Governor General in Calcutta at least 'one Indian' had distinguished himself in the construction work of telegraph lines.

That 'one Indian' was Seebchunder Nandy, the first Indian to make his official appearance in the records of the Telegraph Department. Later to receive high praise both from the Government and the press and to become a Rai Bahadur; Seebchunder Nandy (as the official records spelt, he became 'Sib Chandra Nandy' later on according to his family) was born in a poor family in Calcutta in June, 1824. His later rise in the scheme of things shows that he was entirely a self-made man.

At the age of 22, in 1846, he joined the Government service in the refinery department of the Calcutta Mint under Dr O'Shaughnessy. Bubbling with technical aptitude, he soon caught the eye of Dr O'Shaughnessy who was then the Chemist in the Company's Mint. The young Indian destined to be a telegraph pioneer was selected as 'personal Assistant' by the great Irishman. Together they carried out several experiments in Dr O'Shaughnessy's laboratory.

When, in 1852, the Company Bahadur authorised the construction of the first telegraph line in India, and selected Dr O'Shaughnessy to lead the

enterprise, the Irishman placed his Indian protege 'in charge of the work.' Nandy's association with telegraph in India thus dates back to the first line constructed, that between Calcutta and Diamond Harbour and Kedgeree on the Hooghly. The mint-man became a telegraph-man, the transformation to last for the rest of his life.

It was Seebchunder Nandy who sent the first signal from the Diamond Harbour end on the completion of the line. The message was received at Calcutta in the presence of Lord Dalhousie and Dr O'Shaughnessy. History was made with an Indian at one end of the line and an Englishman and an Irishman at the other. Immediately afterwards, Nandy was appointed an 'Inspector' in charge of the line. He had also to instruct and train other Signallers. Nandy was next only to Dr O'Shaughnessy 'in rank and power' in the department.

In 1855, when the new facility was thrown open to the public, Dalhousie created the post of Director General of Telegraph for Dr O'Shaughnessy. Two Englishmen were created Superintendent and Assistant Superintendent, but Nandy continued as the Inspector of the line. He was, afterwards, given the additional charge of the Post Office at Diamond Harbour. Subsequently he constructed about 900 miles of lines, from East Barrakur to Allahabad, from Banares to Mirzapur, from Mirzapur to Seonee, and from Calcutta to Dacca.

The overhead line was complete. Now came the question of crossing the broad Padma. It was decided to lay 7 miles of underwater cable. No Steamer Company would ask for less than Rs 10,000. Nandy, the telegraph giant, took up the challenge. He utilised only fishing boats. He was successful, and the Government was grateful. Later on, he laid many more cables with the aid of fishing boats.

Beautiful lithographic, three-coloured reproductions of his drawings depicting 'the toddy palm posts' of his invention are in the possession of the National Archives. And when he sent those drawings to O'Shaughnessy on the 30th September 1855, from Sherghottee Electric Telegraph Office, in order to show 'the various methods in which I have used them for our Lines', he was unconsciously recording, officially, the story of the contribution of Indians to the development of tele-communication in India, a story which, although hero-ed by the British, is fundamentally a narrative of an Indian adventure. The reproduction of the Nandy drawing will be found elsewhere

in this book, but the inclusion of Nandy's first recorded letter is essential here in order to illustrate Indian-Englishman relationship then prevailing:—

From

The Inspector, Electric Telegraph,
Benaras Division.

To

W. B. O'Shaughnessy, Esquire,
M.D., F.R.S.,
Chief Superintendent,
Electric Telegraphs in India,
Agra.

Sir,

I have the honour to state for your information that I have this day forwarded to your address at Agra drawings of the toddy palm-posts with their insulators in the various methods in which I have used them for our Lines, together with that of an obelisk lately erected at Dehree, as well as of those proposed for the flying Line across the Soane River and of one for Baroon.

The probable cost of erecting the obelisks across the Soane, as calculated by Mr Overseer Nolan, appears to me to be a very large sum to admit of its being adopted; but if carried out, the Telegraph Line across this broad river may remain for centuries without ever being injured.

I have not been able to send in my General Report up to this day, in consequence of my not having received the necessary informations alluded to in my letter, dated the 19th instant, from Major F. Knyvett and the Deputy Superintendent, Mr Muller; and to avoid any further delay, I shall forward my Report immediately, leaving out the item of the average cost per mile of my Line to be reported in a supplementary Report.

Hoping earnestly that this delay may not be considered to have arisen from any neglect on my part.

I have the honour to be,
Sir,
Your most obedient Servant,
Seebchunder Nundy,
Inspector, Electric Telegraph,
Sherghottee Electric Telegraph Office,
The 30th September 1855.

Plate I

Fig 1

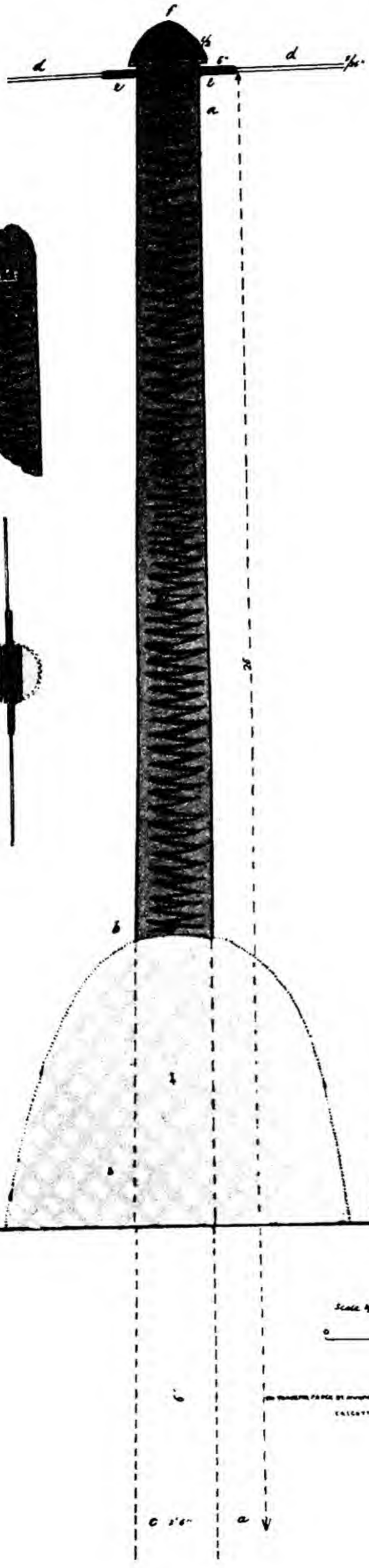


Fig 2

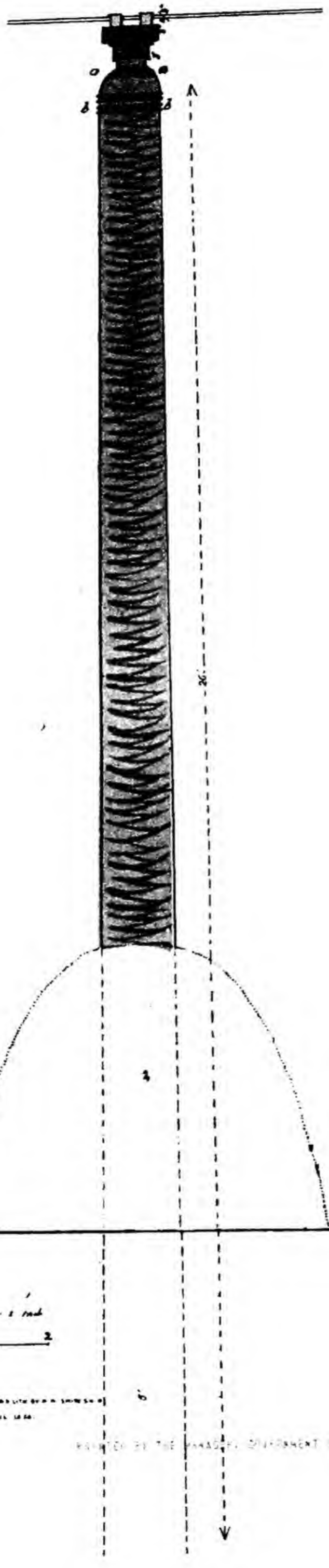
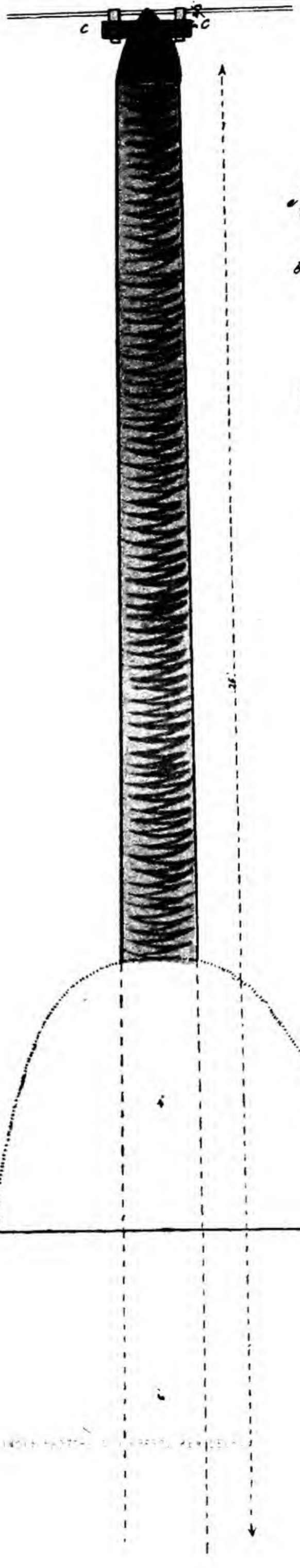


Fig 3



Scale of rail · 1 inch

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CALCUTTA APRIL 1858.

PRINTED BY THE MANAGER, GOVERNMENT OF INDIA PRINTING & STATIONERY PRESS.

Plate. II

Fig: 4

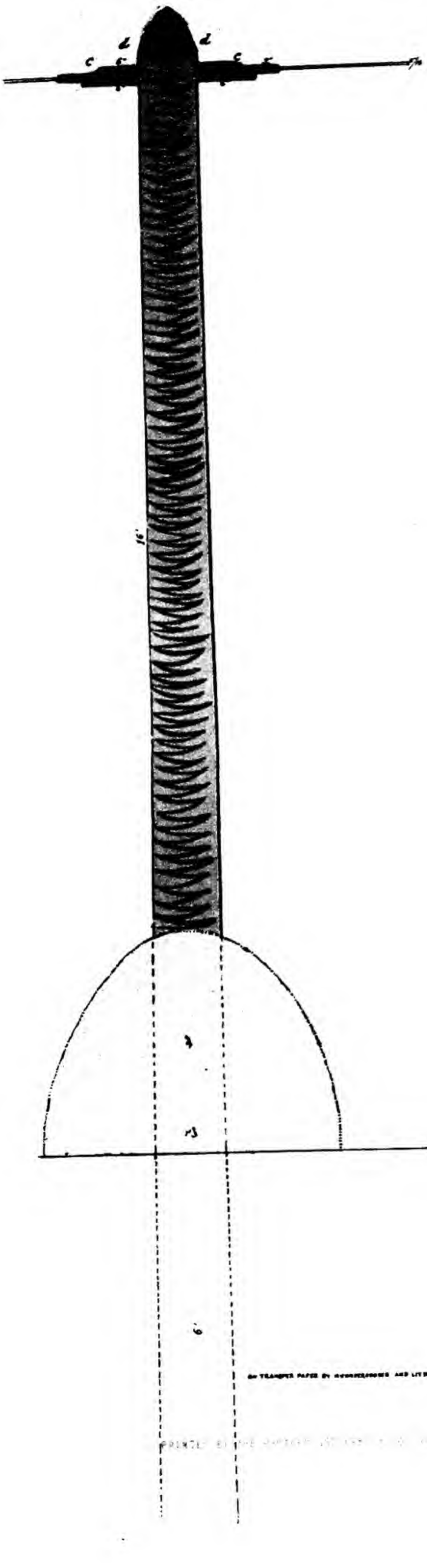
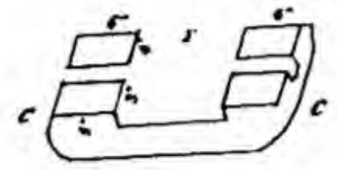


Fig: 5



Scale 4 Feet - 1 Inch

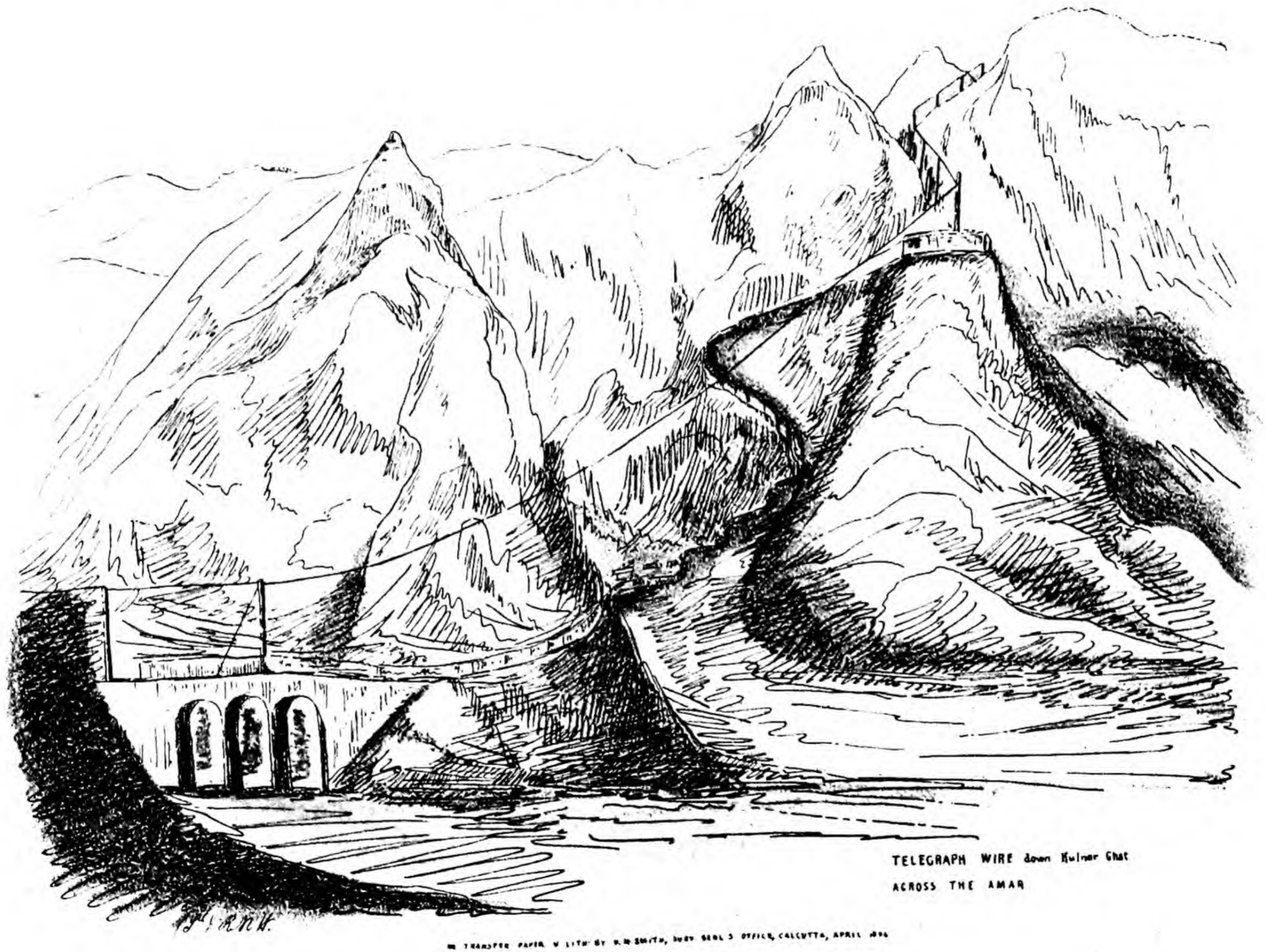
0 1 2 Inch

On TRANSFER PAPER BY HYDROBLUEPRINTS AND LITH BY A. M. SMITH S. D. OFFICE CAL. APRIL 1854

INDORE LINE.—

SINGLE SPAN of 3300 FEET

SKETCHED BY SIR R. N HAMILTON.



TELEGRAPH WIRE down Kulnar Ghat

ACROSS THE AMAR

IN TRANSFER PAPER. W LITH BY H.N SMITH, SURV GENL'S OFFICE, CALCUTTA, APRIL 1856

Came Mutiny. Dr O'Shaughnessy was away on leave in Europe. Colonel Stewart was officiating. During Colonel Stewart's frequent absences from Calcutta for inspection in 'disturbed districts' in 1857-58, as during his stay in Ceylon for constructing telegraph lines in that island, Nandy was in charge of the Headquarters Office. Records Sir Roper Lethbridge in *The Golden Book of India*: 'During the Mutiny of 1857 he rendered excellent service, sometime acting as head of the Telegraph Department's headquarters; and in order to secure the communications between Calcutta and Bombay, he laid down a portion of the alternate line from Mirzapur to Seoni *via* Jubbulpur. He became an Assistant Superintendent of Indian Telegraph in 1866; and retired on special pensions in 1884, in which year he was made an Honorary Magistrate.' He was awarded the title of Rai Bahadur on February 28, 1883.

At the opening ceremony of the Mutiny Telegraph Memorial in Delhi on April 19, 1902, Nandy was present in the role of a hero. Spoke Mr McLean, the then Director General: 'I desire to present Rai Seebchunder Nandy Bahadur, late Assistant Superintendent of Telegraphs, the oldest Telegraph Officer in India, who joined the Department more than fifty years ago on its establishment by the late Sir O'Shaughnessy, the first Director General of Telegraphs whose right hand he was in overcoming the many difficulties experienced in the introduction of the Electric Telegraph into India. Although not directly connected with the events which we have commemorated, Rai Seebchunder Nandy Bahadur rendered valuable services during the infancy of the Department in many parts of India.'

On the same occasion, newspapers throughout the country featured the life of Seebchunder Nandy. The *Statesman* commented on April 25, 1902: 'A Rai Bahadurship seems to have been a poor reward for his excellent services.' A year later, on April 6, 1903, he died of plague during the Calcutta epidemic. The Calcutta offices of the Telegraph Department were closed for a day as a mark of respect. The Calcutta Corporation named a lane after him to perpetuate his memory—the 'Sibu Nandy Lane'.

The generations of Indians which followed Seebchunder Nandy were not as lucky. They had scant scope, because the distrust generated by the Mutiny between nationals and alien rulers barred them from strategic services. Indeed there were exceptions, but they were few and far between.

A change in outlook and policy had to await the end of the nineteenth century. It was about 1895 that Indians began to be recruited as officers. Indianisation began in all services at this time; even the Indian Civil Service was thrown open to Indians. G. B. Roy, who was to become the first Indian Director General of Posts and Telegraphs (to be followed by such figures as Gurunath Bevoor and Krishna Prasada), was the first Indian officer recruited in the Superior establishment of the Indian Telegraph Department. He was a Cooper-Hill's man, and was recruited in England around 1895-96.

A STAMPED CHAPTER

It was in February, 1855, that the public of India was allowed for the first time the use of telegraphs. In those early days, payments for messages was always made in cash (Re 1 for a message of 16 words or less over a distance of 400 miles) at the Telegraph Office counter. Difficulty arose regarding the payment for messages sent by post from places off the line to the nearest telegraph office for transmission. All sorts of experiments were tried for making these payments, such as the use of postage stamps, specially prepared stamp forms and the ordinary fiscal stamp paper, but none of these were successful. Adhesive stamps were already in vogue in the Post Offices, and it was thought that similar special 'electric telegraph' stamps may be prepared and sold at the local treasuries where there were no telegraph offices.

In 1856 orders were issued by the East India Company regarding the printing of 'electric telegraph' stamps, but it was only in 1860 that what are now highly valued by philatelists as the 'Electric' were put up for sale in India. These were oblong in size with the Queen's effigy in the centre, and were issued in three denominations of 4 annas, 1 rupee and 4 rupees. These stamps were 1″ wide and over $2\frac{1}{4}$″ long and were engraved on steel by Messrs De La Rue and Co., London.

The use of the stamps was limited to places where there were no telegraph offices. Enough publicity was not given to the issue of the stamps and as they did not serve an all-India need, this particular stamp issue was, in the words of the then Director-General, 'a complete failure.....due to the limitation placed upon their use'.

The telegraph authorities were not happy with the existing state of affairs, and in August 1865 it was suggested by the then Director-General,

Reference List of Telegraph Stamps

perforated (14) on all four sides

Illustration Nos.	*Year*	*Value*	*Colour*	*Remarks*
			ELECTRIC TELEGRAPHS	
		Rs As		
201	1860	0 4	Reddish purple	No water mark, on Enamelled paper
		1 0	Reddish purple	
		4 0	Reddish purple	
			DOUBLE-HEADED	
202—239 and 242—245	1867—1878	1 0	Yellow green, green	On paper watermarked Crown over INDIA Type III
		2 0	Maroon	
		4 0	Pale blue, blue, ultramarine	
		8 0	Brown	
		1 0	Grey, Pale grey	
		1 0	Pale grey, slate	(Retouched Die, Illustration 216)
		2 8	Yellow, orange yellow	
		2 8	Orange red, orange	(Retouched Die, Illustration 221)
		5 0	Orange brown	
		10 0	Dull bluish green	
		10 0	Bright bluish green	(Retouched Die, Illustration 229)
		14 8	Bright lilac	
		25 0	Grey lilac, lilac	
		28 8	Bright yellow green, green	
		50 0	Pale rose, rose	
		50 0	Rose, rose carmine	(Retouched Die, Illustration 239)

Illustration Nos.	*Year*	*Remarks*
240	..	Mode of receipt for despatch of telegram
241	..	An imperforate pair used on a message
246—249	1881	Provisionals on special adhesive stamps overprinted TELEGRAPH
		In 1882, the above 'double-headed' series were printed on paper watermarked Crown over INDIA (redrawn) Type IV except Rs 14-8 and Rs 28-8 stamps which were discontinued
		SINGLE-HEADED
250—259	1890	On paper watermarked Crown over INDIA Type IV
260	1899	Provisional, overprinted in Calcutta —
262	1900	Provisional, overprinted in London
261	1900	Provisional, on Foreign Bill Stamp, overprinted 'TELEGRAPH' in Calcutta —
263	1900	New Design (Diamond Jubilee head of Queen Victoria) one value only
264—273	1904—1906	Edward VII series

The colours of single-headed Queen and Edward VII series were the same as the corresponding values in double-headed series with slight variations of shades.

Our acknowledgments are due to the Philatelic Society of India, particularly Mr N. D. Cooper, Vice President, for their valued assistance in giving us their permission to use the black and white reproductions of the old Telegraph stamps and supplying the Reference List.

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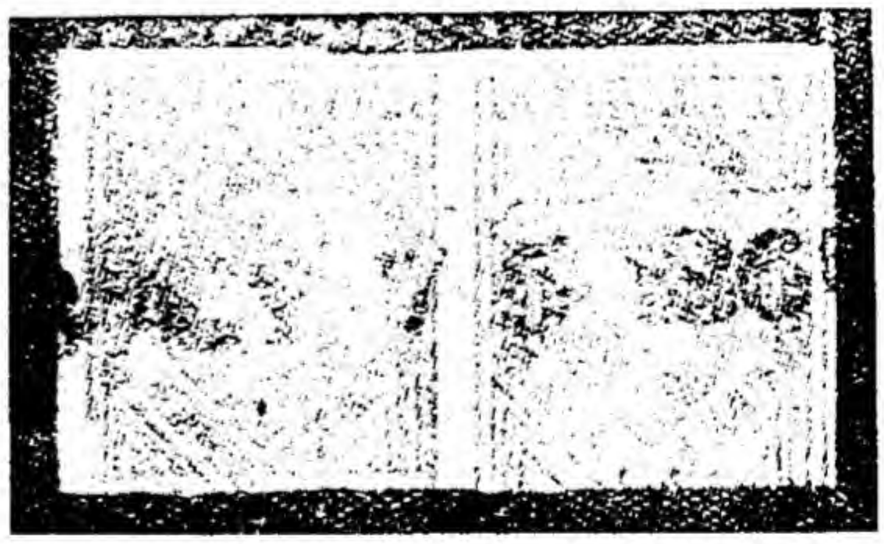

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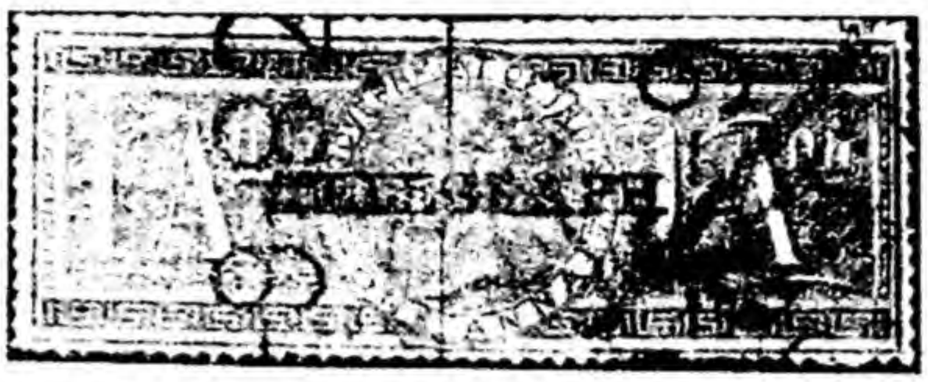

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Courtesy : Philatelic Society of India.

Colonel Robinson, that payment should be by adhesive telegraph stamps instead of partly by cash and partly by stamps. This proposal was not fully accepted by the Government of India. Colonel Robinson was a persistent man. While on leave in England he got his proposal accepted by the Secretary of State for India, over the heads of his superiors in India. The issue of double-headed stamps, in which half the stamp was pasted on the receipt portion of the Telegraph message form, was launched in August 1866. This series of stamp is famous among the philatelists as the 'double headed issue of the telegraph stamps.'

Unusually forthright and original observations were made by Colonel Robinson regarding the use of stamps while making his recommendations to the Government of India:

'Wherever the payments are numerous and of the same class, stamps are universally acknowledged to simplify and effect a complete and easy check on what would otherwise be voluminous and troublesome accounts. They fully save their cost by the interest on money set free for circulation; they are, in fact, a cheap form of paper currency, against which no deposit of the valuable metal is held.'

The 'double headed issue' was in eight denominations from annas 4 to Rs 50. These stamps were also printed by the De La Rue and Co., London. The stamp design consisted of two effigies placed one above the other. The stamps were to be so applied to the message forms that after obliteration, half the stamp would go with the receipt and half with the message. The intention behind the two effigies in a stamp designed to stand being cut up into two was characteristically explained by Colonel Robinson: 'As it is . . . disrespectful, specially in the eyes of the natives of India, to cut the sovereign's head in two . . . I therefore propose . . . to have a stamp with two heads and one legend.'

The consignment of the stamps was received in India in 1867, but these were brought into use after a lapse of nearly two years after despatch due to 'regrettable official delays'. Those over whose heads Colonel Robinson had procured the consent of the Secretary of State for India sought their revenge through delaying tactics. This issue was an immediate success and continued for the next 21 years with minor modifications in the effigy and in the values.

The 'double-headed' had one great defect. The severed head could be

re-used. Colonel Mallock, who had succeeded Colonel Robinson as the Director General, commented in 1889:—

'There is, however, one point in the design of the Indian telegraph stamp which is, I think, open to improvement. I allude to the great similarity between the upper and lower halves which has not only its inconveniences in Departmental practice, but has on several occasions led to frauds being committed by the use of upper halves taken off message receipts being used for franking messages'. So a major change in the designs of the stamps was made in 1890.

To prevent frauds of this kind, the Director-General recommended the adoption of a new kind of stamp in which upper half would be clearly distinguishable from the lower half. The set of new designs submitted by him was accepted without delay with minor modifications and the new issues were introduced in 1890. The issue was in a set of ten, of values varying from anna 1 to Rs 50. These stamps were also printed by De La Rue. The use of this type of stamps continued till 1909 with, of course, changes in effigy brought about by the death of Queen Victoria. Certain other minor changes were also made in the design and values. Until then, the use of telegraph stamps was compulsory in a telegraph office, but there was no such insistence in a combined Post and Telegraph Office where postage stamps could be used except in the case of foreign telegrams.

There had been a stupendous increase in the traffic since the first construction of the telegraph line in the fifties of the 19th Century. Extensive reforms in the telegraph organisation were called for to cope with the expansion. With the help of an expert borrowed from the British Post Office, reforms were introduced in 1909. As one of the results of the re-organisation, it was decided to dispense with the use of telegraph stamps completely, and to use postage stamps even for telegraph messages. The Administration Report for the year wrote the following obituary of the telegraph stamp:

> The sent message form has been reduced to proportions which, while ample for over 90 per cent of the traffic, enable it to be handled more quickly both at the public counter and in the instrument room while the message is ' alive' and also afterwards in the Accounts Branch as a ' dead ' form. The receipt handed to the sender of a telegram which was formerly attached

to the message form is now given on a separate form, whereby the delay of cutting it off the message form has been eliminated. The long telegraph stamps which were affixed half on the message form and half on the receipt and had to be carefully cut through have been abandoned in favour of postage stamps affixed entirely on the message form and the long heavy date stamp has been replaced by a light circular stamp with which the postage stamps are more quickly obliterated. The preamble of the message form itself has been re-arranged with a view to reducing the entries to be made by the Counter Clerk to the minimum requisite number. Senders have been asked to co-operate in the quickening up by affixing the stamps themselves, preferably before the message is brought to the counter. The best results have followed these changes. Senders are no longer delayed inordinately at the counter and each Counter Clerk is able to deal with a much larger number of messages in a given time than formerly.

Thus ended the 'stamped' chapter in the history of Indian telegraphs.

'SUCH AN ENGINE OF POWER!'

Dreams of overseas extensions lay behind Dalhousie's backing of O'Shaughnessy's trips to England and America. Besides several new lines within India itself being 'in contemplation, it was hoped that the country would be linked with countries across the seas through submarine routes.' Writing in 1856, almost on the eve of the so-called Sepoy Mutiny, but apparently not experiencing its forebodings, Dalhousie recorded 'readiness to co-operate with the Government of Ceylon in extending the Indian lines from the Presidency of Madras to Point De Galle.' By this time the Court of Directors of the East India Company were persuaded to sanction the expenditure of India's money on any joint venture 'for laying down a submarine Telegraph across the Mediterranean and the Indian Sea' so that the system of Electric Telegraph in India may be 'united with those which envelope Europe, and which already seek to stretch across the Atlantic Ocean'. India was ready and willing to play her part in the evolution of a one-world network of swift communication. At the same time, it was not very improbable that the Company's intentions were to tie India closer to

its headquarters in London at India's cost.

The Government-owned public-utility nature of the Indian Telegraph, already mooted, enabled Lord Dalhousie to claim that the Government of India did not desire 'to derive any surplus revenue' from the system. But the public, apart from the Company Government, was making increasing use of the telegraph for the transaction of private business. 'Superintendent' O'Shaughnessy was able to assert that the 'monthly cash receipts have, even in the first year, very largely exceeded the sum anticipated (namely, 10,000 rupees)'.

Political and military advantages were never far from the British mind when it thought of 'such an engine of power'. The man who coined the apt phrase, Lord Dalhousie, himself highlighted 'two remarkable instances' in order to convince the Company of the telegraph's political value. Wrote Dalhousie: 'When Her Majesty's 10th Hussars were ordered with all speed from Poona to the Crimea, a message requesting instructions regarding their despatch was one day received by me at Calcutta, from the Government of Bombay, about 9 o'clock in the morning; instructions were forthwith sent off by the Telegraph in reply and an answer to that reply was again received at Calcutta from Bombay in the evening of the same day. A year before, the same communication, for the despatch of speedy reinforcement to the seat of war, which occupied the Telegraph no more than twelve hours, could not have been made in less than 30 days'. From 30 days to twelve hours was the telescoping of time by the telegraph and it made all the difference between defeat and victory.

The other instance cited by Dalhousie related to the 12th Lancers. It was decided that they should be despatched to the Crimea from Bangalore, in place of the 14th Dragoons from Meerut. Forthwith Bangalore was contacted through the telegraph. The Corps was immediately got ready for service; they marched 200 miles to Mangalore port, and were there before the transports were ready to receive them. Concluded Lord Dalhousie: 'The Electric Telegraph enabled the Authorities in India to give to Her Majesty's Government, in its hour of need, two magnificent Cavalry Corps of not less than 1,300 sabres, and to despatch them to the Crimea with a promptitude and timely alacrity which exceeded all expectations, and which in the circumstances of the previous year would have been utterly impracticable'.

THE EVE OF 'THE MUTINY'

At the end of 1856, on the eve of what British historians call the 'Sepoy Mutiny,' there were 4,250 miles of Electric Telegraph in India and 46 receiving offices. The telegraph map of India printed on a separate page shows the disposition of the offices at that period and the network which linked them to Calcutta, the seat of power. By 1st February 1855, a service which was previously reserved for the Company's purposes alone was thrown open to the public at the nominal tariff rate of Re 1 for each 16 words transmitted over 400 miles.

A year earlier, in 1854, the first Telegraph Act of India, defining the privileges and powers of the Government and other allied matters, was enacted. Preserved to this day in its pristine form in the *Bengal Almanac* No. xxxiv of 1854, it contained 23 clauses and a preamble. It provided penalties for establishing or maintaining unauthorised electric telegraph, and also for using such a contraband system. It prescribed punishments for cutting lines, a form of theiving as well as a stratagem of political agitation in India from early days. It empowered the Government to take over telegraph established even by licence. It authorised the Telegraph Department to loan lines to the Railway.

The Company Rule had, by this time, full sway over the Punjab, North-West Frontier Province, 'Nerbudda Province,' Bengal Province, Madras Presidency, Bombay Presidency, 'Nagpoor,' inhabiting around 112,500,000 people. 'Native States' included the Nizam Dominion, Bundelkhand States, Scindia Dominion, King of Oudh, 'Cis-Sutlaj State,' Gaikward Dominion, Raja of Travancore, 'Row of Cutch', Raja of Nepal and Rajputana, totalling a population of 160,600,000.

'Superintendent' O'Shaughnessy, for all his importance, was receiving a salary of Rs 2,000 per month, while his Deputy in Calcutta was receiving Rs 800. 'The reproach of tardiness,' wrote Dalhousie, in the transaction of Indian business in those days which had already begun to move fast all over the world, had been 'removed'. Dalhousie concluded his minute of 1856: 'I make bold to say that whether regard be had to promptitude of executive action, to speed and solidity of construction, to rapidity of organisation, to liberality of charge, or to the early realisation of a vast magnitude of increased political influence in the East, the achievement of the Hon'ble Company in the establishment of Electric Telegraph in India may challenge comparison

with any public enterprise which has been carried into execution in recent times, among the Nations of Europe or in America itself.'

SOS FROM 'AMBALLA'

The oldest telegrams in their original form in the possession of the Department relate to the Mutiny. When the British were pressed against the wall for the first time since the East India Company was established in 1601 at Calcutta, the Indian Telegraph, which Dalhousie had described as 'such an engine of power,' and which had been instrumental in 'the early realisation of a vast magnitude of increased political influence in the East,' stood them in good stead and eventually helped in spelling victory. Here was the supreme irony. A network which was destined to crystallise the sense of nationhood in India was also instrumental in defeating the first organised expression of Indian aspiration to be free—the 'Sepoy Mutiny'. As evidence of the crucial part played by the Indian Telegraph, we give below two telegrams, reproduced in photostatic form elsewhere, sent from Delhi to 'Amballa' and thence to all stations:

Recd. for trans—Date 11th May 1857.

From Amballa
To All Stations.

The following just recd. from Delhi. We must leave office all the Bungalows are being burnt down by the sepoys of Meerut. They came in this morning. We are off don't roll today. Mr C. Todd is dead we think. He went out this morning and has not returned yet. We heard that nine Europeans were killed. Good bye.

Rawelpindee L. N. Fraser.

Message from Delhi 11th May
From Brigadier Frazer
Comdg at Delhi
Number of Words 78 *Service*

To Amballa
To Brigadier Comdg at Amballa

Cantonment in a state of seige. Mutineers from Meerut. 3rd Light Cavalry number not known said to be one hundred and fifty men cut off. Communication with Meerut taken possession of the Bridge of Boats. 54th N. I sent against them but would not act. Several officers killed and

Written No. 6

HON'BLE EAST INDIA COMPANY'S ELECTRIC TELEGRAPH.

—:oOo:—

Messages, (not exceeding 16 words,) can be sent any distance not exceeding 400 Miles, at a charge of 1 R
Ditto ..... Ditto ..... Ditto 800 " " 2 R
Ditto ..... Ditto ..... Ditto 1,200 " " 3 "
Ditto ..... Ditto ..... Ditto 1,600 " " 4 "

Message from Delhi 13th May
From Brigadier Graves Commdg at Delhi
Number of Words 7 8. Service Prepaid

To Umballa
To Brigadier Commdg at Umballa

Continuance in a state of siege. Advices from Meerut. 3rd Light Cavalry under not known said to be murdered and fifty men cut off. Communication with Meerut taken possession of by Brigade of Boats. 5th & 11th N.I. sent against them but would not act. Several officers killed and wounded. City in a state of considerable excitement. Prospect about but nothing certain yet. Further information will be forwarded Copy to be sent to Brigadier in Command

Ramsfindee

Electric Telegraph Office, 12th May 1857.

L. A. Fraser.
Inspector in charge

N.B. Any query respecting this Message to be attended to without the production of this Paper

7.20 P.M.

N.B. — Please count Time of delivery

Reproduction of the Mutiny Telegram

No. MESSAGE TO BE SENT BY ELECTRIC TELEGRAPH.

Words Charged for Rs. Recd. for Date 11th May 1857

From Umballa To All Stations

The following just recd. from Delhi
We must leave office all the Bungalows
are being burnt down by the Sepoys
of Meerut. They came in this morning
We are off dont roll today. Mr. C. Todd
is dead we think. He went out this morning
and has not returned yet. We heard
that nine Europeans were killed.
Good bye.

Cond. Find.

Time recd.

Time sent

Received by From Station

Repeated by To

Sent on by To

Rep. received by From

[illegible] [illegible]

Reproduction of the Mutiny Telegram

wounded. City in a state of considerable excitement. Troops sent down but nothing certain yet. Further information will be forwarded. Copy to be sent to Brigadier in Command Rawelpindie.

L. N. FRASER,
Inspector in charge.

Electric Telegraph Office
12th May 1857.
Despatch 7.20 a.m.

When there was all quiet on the Indian front once more, it was calculated that the 'Mutineers' had destroyed 918 miles of telegraph wire causing a damage of five lakhs of rupees.

II. The Lengthening Lines

THE CAPITAL CITY of India has always been the key to communications. The current importance of Delhi was once enjoyed by Simla, and long before that, Calcutta was the nerve-centre. The East India Company first pitched its tents in that east-coast anthill, and the Viceroys of 'Her Majesty the Empress of India' continued to wield authority on an unwilling people from Calcutta even after 1858. The telegraph was always regarded as an avenue of power, and so it radiated from Calcutta although that city was in a corner of India and not at the core. The first line originated in Calcutta and started toward Diamond Harbour. Other lines picked up their march, toward Agra and Peshawar and in the south toward Madras, but all of them stemmed from the Kothi of the Company Bahadur, from Calcutta.

The story of the lengthening lines, which eventually grew into one of the largest and most complex networks in the world, is an account of fight against nature, against mountains and rushing rivers and sharp-clawed animals and against the wiles of warring tribesmen. In the advancing and turning and branching lines of the telegraph is to be seen the early directions of British ambition, now toward Burma, now toward the Chin Hills in what is currently called Assam, now toward Sikkim nestling in the Himalayas, and then toward Afghanistan across the Khyber Pass and in the south toward the nose-tip of Ceylon. The frontiers of the growing empire were pushed back by the armies no doubt, but they were tied and consolidated to Calcutta by the iron or copper wire of the Indian telegraph department. And the army had the advantage of long traditions, while the telegraph's pioneers had to illuminate their own path as they carried Calcutta's tentacles in four directions.

EIGHT POSTS TO A MILE

Accepted practice in other countries had little to guide Indian pioneers. Improvising, Dr O'Shaughnessy used heavy iron rods 3/8 inch in diameter and weighing one ton per mile. These were obtained from England in short lengths of 13½ feet each, were welded into 200-foot lengths at Calcutta depots, finally turned into continuous rod and then erected on bamboo supports with wooden poles at intervals of 8 to the mile. The rods were attached to the supports by metal clamps, and no insulators were used. According to reports at the time, the line worked well, even in heavy rain; it was claimed that the fact that the line was not insulated gave great protection from lightning, as, the moment rain fell, the line started to be safe.

Part of the line was carried underground. The conductor was the same as the overhead wire, protected by two layers of Madras cloth saturated with melted pitch and tar and laid in a row of roofing tiles filled with a melted mixture of sand and resin. The river cables were of English make, guttapercha covered copper wire, which was secured for protection against dragging anchors in the angles of $\frac{7}{8}$ inch chain cables. One of these cables, 2,070 yards long, was laid across Hooghly at Diamond Harbour; another, 1,400 yards long, across the Haldi at Kedgeree. The success of these small ventures was contagious. For Lord Dalhousie it was a green light, and for the cautious souls of the Court of Directors, an occasion to pick up courage. Immediate construction of over 3,000 miles of lines between important towns was sanctioned forthwith.

FROM PILLAR TO POST

The story of Indian telegraph posts is a saga in itself. Beginning with the granite and masonry pillars, passing through bamboo forks and Seebchunder Nundy's 'toddy-palm posts', they eventually caught up with the iron age. The posts received from England during the year 1872 were a modification of the former pattern of Hamilton standards, and were designed by Captain Mallock. Without materially sacrificing strength or height, it was found possible to reduce the weight of posts by about 25 per cent, and notwithstanding the great increase in the price of iron, the new posts cost, landed in India, about one rupee less than was paid for the former posts at a time when iron was much cheaper. At the then prevailing price of

iron, the saving to Government on each post by this modification was estimated at Rs 5. The reduction on cost of transport in India was an additional saving. Another great improvement in these posts, of which there were three or four series adaptable to different kinds of lines, was that all the component parts were so designed as to form a variety of combinations and could be readily used in conjunction with the old patterns of posts received from time to time during the decade before 1873.

Experiments were being made as to the suitability of one or two kinds of foreign timber for use in India for telegraph posts. Fifty of these posts were landed in Calcutta in February 1871, at an average cost of Rs 11 As 8 each. Some of these were shortly afterwards erected on the River Hooghly lines, and others had been erected in Cachar, the East Coast, Cawnpore, Arracan and the Malabar Coast, to be observed and studied annually. The posts were, therefore, subjected to a great variety of climates, some of the places chosen being specially deleterious to their preservation. From reports received, the posts showed no signs of decay. This experiment was apparently abandoned due to difficulties of transport. Next we hear of wooden posts being used was in the second World War. The Department is at present considering using suitably treated wooden poles but only in the regions where the timber grows.

It is a far cry from 1850's when we had granite pillars carrying one or two wires at the most, to the coupled post lines of today which can carry 18 pairs of wires and are so designed that the line is capable of providing a large number of Telephone and Telegraph Channels.

HIGH GRANITE AND LOW COST

The march was rapid, but the construction was nevertheless thorough. Compared with any country in the world at that time, the Indian telegraph lines were 'substantial'. 'The line for three-fourths of the distance from Madras to Calcutta is superior in solidity to any created elsewhere', claimed Lord Dalhousie in 1856. Some portions of its length stood 'without a rival in the world.' For 174 miles it was borne on stone masonry pillars capped with granite, while for 332 miles it was sustained on superb granite, 16 feet high above ground, in single slabs. And yet, Dr O'Shaughnessy, was able to claim that the tariff charge on the Indian lines was 'as cheap

as that in use in any other country having lines of such length as permit a fair comparison with ours.'

A message of 20 words sent 400 miles in England in those days cost 5 shillings; a message of 24 words sent across 420 miles to Benares cost only 3 shillings. On the Continent of Europe, a message of 24 words sent from London to Trieste cost 22 shillings; a message of 24 words from Calcutta to Bombay, across the same distance of about 1,600 miles, cost only 12 shillings. A message of 16 words sent from New York to New Orleans, 2,000 miles, cost around 13 shillings and 6 pence in 1856; a similar message of 16 words sent from Calcutta to Bangalore, more than 2,000 miles, cost only 10 shillings.

FROM CALCUTTA TO PESHAWAR

On the strength of Dr O'Shaughnessy's performances and report, and bolstered by the recommendation of the Governor of Bengal, the Governor General in Council took a fateful step on the 23rd of April, 1852. He not only sent a plan of telegraph expansion involving construction of 3,000 miles of wire between important towns to the Court of Directors of the East India Company in London; he despatched Dr O'Shaughnessy along to be on hand. The result was detailed discussion but prompt action. The entire proposal of the Government of India was sanctioned on the 23rd of June, exactly two months later. During the rest of that year, and through the greater part of the next year, Dr O'Shaughnessy was engaged in procuring and despatching from England the immense mass of materials which was required for the far-flung project.

The working party started from Calcutta on the 1st November, 1853, a red letter day in the history of Indian Telegraphs, with a view to linking Agra by a telegraph line. On the 24th March, 1854, a message was sent over the line from Agra to Calcutta, a distance of 800 miles, which had been completed in less than five months.

'The vigour which was thus apparent at the commencement of the work', observed Lord Dalhousie in a minute prepared on 22nd February, 1856, surveying the telegraph operations from the beginning, 'was fully maintained throughout all the subsequent progress.' By February 1st, 1855, only fifteen months after the commencement of the work, all the lines from Calcutta to Agra were opened. What is more, all the lines from Agra

to Bombay and Madras were also thrown open. These lines included forty-one offices, and they covered over 3,050 miles of space. And by 1856, Peshawar was linked to Calcutta *via* Agra; Ootacamund *via* Bangalore; and Meeday on the Burmese frontier *via* Rangoon. Between November 1853 and February, 1856, 4,000 miles of electric telegraph had been laid down, and placed in working order.

Every mile of their forward march entailed fresh difficulties. 'The country crossed offers enormous difficulties to the maintenance of any line', wrote Dr O'Shaughnessy from some where in Central India 'There is no metalled road;' he continued, 'there are few bridges; the jungles also in many places are deadly for at least half the year; there is no police for the protection of the line. From the loose black cotton soil of Malwa to the rocky waters of Gwalior, and the precipices of the Sindwa Ghats, every variety of obstacle has to be encountered.'

From Calcutta to Peshawar and Calcutta to Ootacamund about seventy principal rivers were crossed, some by cables, others by wires extended between masts. The cable across the roaring Soane measured 15,840 feet, and the crossing of the 'Toongbudra' was two miles in length. These were grand achievements compared with any country in the world at that time. And yet cost was low, very low. The construction of 4,000 miles of telegraph lines, working of all the offices for two years, spare stores on hand, instruments, buildings and houses, etc., did not exceed in cost 'twenty-one lakhs of rupees, or little more than 500 rupees a mile', reported Dr O'Shaughnessy to the Governor General.*

UNDER THE SEA TO CEYLON

The post-Mutiny progress was in many directions, but it was more intense in the field of 'Overseas Communication'. The first Indo-Ceylon Cable was laid in 1858. According to *Bombay Times and Journal of Commerce* dated May 12, 1858, 'Sir W. O'Shaughnessy' travelled to Colombo 'in the Sir Jamsetjee Jeejeebhoy Steamer', there to find pieces of wire and

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*These days a pair of 200 lbs copper wire costs Rs 2,500 per mile. The cost of posts at 32 per mile is Rs 1,800. Thus the cost of erection of a pair (long distance circuit) on posts is Rs 4,300 per mile as against Rs 500 per mile in 1851.

guttapercha and canvas 'broken, melted and burnt in the late thunder storm worthy of notice'. But the submarine cable soon reached the strait and simultaneously the line to Kandy was completed. A correspondent wrote to the same paper from Talla Maneer on 14th September (published on October 2nd), 1858: 'I am happy, thank God, to tell you that the Electric Cable is across from Tanacoodia to this place.....This is a great feat accomplished. No cable has ever been laid down 20 miles long without the aid of a steamer; ours was a native craft with Malabar coolies; they have done their work well indeed'. The first line was supplemented with a second one in 1867.

On 1st July, 1880, the Indian Telegraph Department, which hitherto was looking after the Ceylon Telegraph System, transferred the responsibility to the Ceylon Government.

The cable connecting Ceylon with India failed in October 1883 and again in March 1884, and although temporarily repaired, its condition was found to be so precarious that the necessity for laying a new one had to be faced. This cable was laid in 1867, replacing the one of the 1858 vintage, so that it would have nearly twice as long a life.

During the month of March 1885, a new cable was laid between India and Ceylon, the cost of which was borne by Ceylon according to an agreement made in 1867. The second cable, which was laid in 1867, to replace that of 1858, was at the same time repaired. There were, therefore, two cables working between India and Ceylon. The new cable was manufactured in the factory of the Indo-European Telegraph Department in Karachi, and carried to Ceylon in the Government cable ship 'Patrick Stewart'. The operation of laying the cable was under the direction of the Acting Engineer and Electrician of the Indo-European Telegraph Department, while the shore ends were laid, and the old cable repaired, under the immediate supervision of the Chief Superintendent of the Madras Division.

The Indo-Ceylon Cable, our only submarine line, was of two types. The India-rubber-covered one was put under the sea in 1867; while the guttapercha-covered cable was laid in 1885. Both began to deteriorate by May 1894. Communications were maintained by Cardew's vibrating sounders, one at Pamban-India and another at Manner-Ceylon, using both the cables after looping them together. Successful communication was

finally established when the guttapercha cable alone was used with a battery arrangement of 13 Minotto cells, ten in series and three in parallel at each office, and an artificial resistance of 250 ohms had been inserted in the circuit. A special signalling key was an added device. By March 1895 the armoured (Brass taped) cable, prepared by Indo-European Co., was laid and the India rubber cable of 1867 recovered. This newly laid armoured cable only replaced about 13 knots of the old guttapercha cable laid in 1885, as the other portions of the old cable were found in good condition. Again in 1894 this cable failed due to the attacks of the 'teredo' insect and in March 1897, the whole guttapercha cable was replaced. The work was carried out in March 1897 with the aid of the Indo-European Telegraph Department cable steamer 'Patrick Stewart', and the new cable was brought into use on 15th March, 1897.

The Indo-Ceylon cable failed again on 15th January 1925, and a temporary Camp Telegraph Office was opened at Rameswaram on the 7th March, 1925, for vibrator working over the faulty cable.

THE 'BALANCE OF THE WORLD'

Ceylon was the first target of India reaching out. The process of reducing India's insularity now flowed toward Europe. The heroic adventure eventually culminated in the formation of the Indo-European Telegraph Department of the Government of India. Its executive operations were almost entirely outside India, in the Persian Gulf and Persia. It was an anomaly in that it was the only Department of the Government of India with its headquarters in London and under the direct administration of the Secretary of State for India. The step-by-step story was told by Maurice G. Simpson, once Director-in-Charge of the Indo-European Telegraph Department, in a 1928 issue of the *Journal of the Royal Society of Arts.*

In 1861, the Government of India instructed Colonel Patrick Stewart, a brilliant young officer of the Royal Engineers, to make a survey of the Mekhran coast and of the Persian Gulf. The following year he prepared a scheme in which he recommended that a land line should be constructed from Karachi westward as far as Gwadur, and that a series of cables should be laid thence to Fao at the head of the Persian Gulf. A little later he proposed that the cables should be extended from Gwadur to Karachi, thus duplicating communication over this section where, it was feared, the

cable might be exposed to damage from the heavy seas under the south-west monsoon.

The plan was bold. Confidence in submarine cables had been badly shaken by the failure, two years previously, of a cable laid in the Red Sea as part of a submarine route to India; but it was believed that the causes of the failure were well understood and could be avoided. Colonel Stewart's project received the support of the most eminent electricians of the day, among them Professor William Thomson, afterwards Lord Kelvin. The scheme was approved and Colonel Stewart placed in charge. The cable was manufactured at Messrs Henley's Telegraph Works at Woolwich. 'It was sent out in five sailing ships to Bombay, whence the ships were towed by steamers of the Indian Navy to Karachi and up the Gulf and the cables were laid in the sea without any serious accident.' The Gwadur to Mussendom section was completed in February, Mussendom to Bushire in March, Bushire to Fao in April and Gwadur to Karachi in May, 1864, 'thus completing the connection between Karachi and Fao in readiness for the Turkish line, on to Constantinople, which was completed some months later in January, 1866'.

Previously, one Mr Walton of the Indian Telegraph Department had been deputed to construct the land line from Karachi to Gwadur. In constructing this 400-mile of line, he encountered very great hindrances, not only because of the utterly barren and inhospitable nature of the country, with the consequent lack of water and difficulties of transport, but also because of 'the jealousies, bickerings and opposition of the local petty Chiefs.'

As mentioned earlier, the Turkish line from Baghdad to Khanikin on the Persian Frontier was completed in October, 1864. The line from Khanikin to Tehran and thence south to Bushire was constructed on behalf of Persia by British Engineers. It was commenced in 1863 and was completed in October, 1864, but the line was so continuously interrupted that it was never really opened and, in fact, 'the Baghdad to Tehran section has never been used for international telegraph traffic with India.'

The first telegraph communication between Europe and India was effected on the completion of the Baghdad-Fao Section of the Turkish line on January 27th, 1865. 'It is pathetic to recall that Colonel Patrick Stewart to whose energy, perseverance and remarkable abilities the success of the

project was mainly due, died at the early age of 33, in Constantinople, on the 16th January, 1865, a few days only before the completion of the connection between Europe and India for which he had worked so strenuously.'

The number of messages exchanged was only 62 in the month after the opening, but this number quickly increased, and in the following December 2,365 messages were exchanged, the charge for a telegram being £5 for 20 words or less while the average time of transmission was 6 days, 8 hours and 44 minutes. At this time a letter to Bombay took just over a month on the way, being carried by sea. In the same year efforts were made to transmit messages *via* the Russian lines, which had been extended through Tiflis to Tehran, but the service was found to be most indifferent, the average time of transit being 17 days 5 hours and 5 minutes, 'while messages were so badly mutilated as to be unintelligible.'

The delays in messages between England and India were the subject of universal complaint, until Messrs Siemens and Company offered to construct an independent double line of telegraph from London to Tehran, provided the British Government gave them adequate support. They received this support, and Messrs Siemens of London and Messrs Siemens and Halske of Berlin were able to obtain the necessary concessions from Germany, Russia and Persia. 'An English Company called the Indo-European Telegraph Company was formed to take over the concessions and work them, with the result that the combined Indo-European Telegraph Company, and the further section from Tehran to Karachi *via* Bushire worked by the Indo-European Telegraph Department of the Government of India, was opened for traffic on January 31st, 1870.' The Average speed of messages was immediately increased; in 1871 the average transit time by the Turkish route was 1 day 6 hours and 20 minutes and by the Indo-European route only 6 hours and 7 minutes.

On the evening of June 23, 1870, in London, and at the corresponding time in Bombay (early 24th morning), a grand telegraphic party took place in celebration of the completion of the submarine system of telegraph between India and England and thence to the American Hemisphere. Speakers eulogised 'the close union now between the Glorious East and marvellous West,' the Prince of Wales being present at the London end. Two days later the Viceroy of India from Simla greeted the President of the United States

in Washington: 'May the completion of this long line of uninterrupted communication be the emblem of lasting union between the Eastern and Western worlds.' Replied President Grant: 'I congratulate you upon the successful connection of your country with the balance of the world'.

FROM MADRAS TO PENANG

That was towards Europe and the Western Hemisphere. We had not neglected our Eastern neighbours. Our lines went under the water towards them from Madras. The Madras-Penang cable was interrupted on three occasions during the year 1886; from 4th September to 21st September; from 3rd November to 7th November; and from 12th November to 26th November. Exasperatingly at the time of the first interruption, the alternative cable from Rangoon (Elephant Point) to Penang failed simultaneously, thus cutting off all traffic with the Eastern Extension Cable Co. The Siam line proved itself quite unequal to the transmission of the China traffic which fell upon it, and, for this short period, both Australia and China were dependent for communication solely on the Great Northern Telegraph Co.'s line through China and Asiatic Russia. However, loss on our portion of traffic was temporary.

NORTH, WEST AND EAST

Presently the time came when lines from India began to extend north, west and east. Tibet in the north asked for and received the aid of Indian technicians. In August 1922 a line was erected by the Department from Gyantse to Lhasa in Tibet and made over to the Tibetan Government. The line worked well and till the end of March, 1923, there were no interruptions. All through the later political changes and upheavals, India helped Tibet in maintaining communication lines, although they were owned by the Dalai Lama. That land-locked mountain fastness's only contact with the outside world was through India. The picture remained unchanged until Mao Tse-Tung's troops entered Tibet. Indian experts were among the last to leave that roof of the world known as Shangri-La.

Our other neighbour on the north, Nepal, however had remained in isolation, telegraphically speaking, till the other day. Raxaul being the telegraph station on the Indian side of the frontier, the telegrams meant for Nepal had to be taken by runners from Raxaul in India to Birganj in Nepal.

This isolation came to an end in January 1950 when a radiotelephone link was established between Kathmandu and Patna on the sacred Ganga. Never was a telephone link as welcome as this, as it was this circuit which carried the news day by day of the heroic efforts of the British mountain climbers on the slopes of the mighty mount Everest, and it was this link which electrified the world with the news that Tensing, the Indian, and Hillary the New Zealander, had set their feet on the roof of the world. Sir John Hunt, leader of the victorious Everest expedition, presented a chair cushion to the Indian Embassy telegraph office in Kathmandu for its splendid work in clearing 'Everest traffic.' It was a piece of Sherpa handicraft, bought in Namche Bazar. The Indian wireless system which is Nepal's only link with the outside world, was overtaxed with Everest traffic.

Now to the west winds. The Indian Radio Telegraph Company's telegraph circuit between Bombay and the United Kingdom, which was opened in 1927, had been working in competition with the Beam Wireless link between Bombay and the United Kingdom up to the end of June of 1932. Negotiations for joint working came to a successful conclusion and resulted in the formation of the Indian Radio and Cable Communication Company. This Company took over the cable heads at Bombay and Madras. On the 1st July 1932, working of both cable and wireless circuits by the joint concern at terms approved by the Government of India, in conjunction with concerned parties, came into effect. The Company did not deal directly with the public except in the case of foreign urgent telegrams received for delivery in Bombay. All messages were booked or delivered by the Indian Posts and Telegraphs offices.

A termination came in the east. During July 1937 the Burma telegraph system, which was a part of the Indian Telegraph Department, was separated, because Burma was separated, from India. The wires remained the same, built at tremendous human cost and daring, but below them the land developed new political frontiers. By the same token and in the same year, the Aden telegraph system, another feather in the Indian turban, broke off from India because Aden ceased to be a part of the Indian Empire.

THE KASHMIR STORY

Winds of fashion always blew from British India to the 'Native States.' Technological progress, especially, originated under the British inspiration,

and the Princes were slow in adopting it. Some Maharajahs were even anxious to keep their territories in glorious isolation by resisting for a long time developments in transportation; they were afraid of giving easier approaches to the 'Firunghees.' Such was the case of Kashmir, which was loath to have land connections with the plains, and which refused to blast the Banihal Pass to its own peril, as it turned out in 1948-49. But the electric telegraph was another matter; it extended the range of rapport without ceding a foothold. By 1877, Maharajahs were vying with each other as to who would be the first to receive the mark of progress, and the Ruler of Kashmir was no exception.

The royal wish was to link Jammu and Srinagar with the rest of India, so that Gilgit could be connected telegraphically with Srinagar on a later date. The Telegraph Department volunteered to supply all material except posts; Kashmir had an over-abundance of timber. An officer as well as a construction party were placed at the disposal of the State.

Operation Kashmir was no easy matter. It was a question of altitude. The Himalayan snow was the main enemy. A line started from Srinagar toward Gilgit in the August of 1877, but it had to cry a halt by the 14th of October because snow had started its counter operation; some 94 miles were spanned in the meanwhile. A similar fate awaited in the direction of India. Workmen started their arduous march from Srinagar toward Jammu on the 14th of November. The distance as far as the northern foot of the Banihal Pass was studded with posts. Suddenly the work had to stop. Heroic efforts, conversely, began at the Jammu end, and a short section of the line was completed by the end of the year.

Progress was slow. That valley biasedly blessed by nature suffered from a scarcity of food. Ironically, Kashmir that supplies timber to the rest of India could not supply enough poles to the telegraph constructors. And nature, so beautiful there that a Mogul Emperor had pronounced it 'the heaven on earth', mercilessly drove the telegraph conductors to cry out 'hell'. There were cases of frost-bite. There were sickness and illness. Obviously, the construction party was not on a picnic.

The main work had to await the year 1892. Dual control had dubious value, so the Indian Telegraph Department extended its sway over Kashmir and took over the responsibility of construction and control. Orders to proceed toward Gilgit *via* the Burzil (13,500 feet) and Tragbal (11,000 feet)

passes were received on the 25th August, 1892. Before the demon winter set in, the line was taken to the crest of the Tragbal Pass, a distance of forty-four undulating, zigzaging, brush-covered miles. The winter of 1892 was especially severe, yet a height of 12,000 feet was reached. Canadian Snow Shoes were used by the construction men. A second wire was provided from Srinagar to the Kashmir Frontier near Kohala. By 1895, Astor, at a distance of 197 miles and over the Tragbal and Burzil passes, was firmly linked with Srinagar. The 62 miles between Astor and Gilgit, especially trying, were not only spanned, but the line was kept in repair continuously even at that staggering height. Interruptions by avalanches were immediately plugged. A system of 'altering alignment' in the light of the behaviour of avalanches was introduced; the need for 'exceptional arrangements' for such high altitudes was recognised.

Strong, healthy men were selected as linemen and they were provided with shelter houses and block-huts at frequent intervals. They were often cut off, especially at Guraiz and Minimarg, from their 'fellow creatures during the long, cold dreary winter months'. The task of repair parties operating in those snow-clad mountains was always full of danger. A description from the 1895 Departmental Report illustrates the point:

> 'An interruption caused by the breaking of a connecting wire near Sirdar Kot lasted from 28th December 1894 to 2nd January 1895 and the restoration of communication involved a party from Minimarg crossing the Burzil Pass, 13,500 feet, at a time when a bad storm was raging. On the first day the party with difficulty reached Burzil Chowki, taking nine hours to do six miles. Two khalassis collapsed and were left behind, until the rest of the party after depositing their loads, could go back and bring them in—an operation attended with much difficulty. During the march one of the signallers fell through a snow bund in the Burzil Chowki. On the 31st December the party started again and succeeded in reaching the hut or the top of the pass, taking the whole day to do 5 miles. On the 1st January the descent was commenced notwithstanding that it snowed heavily, and the hut at Sirdar Kot, 5 miles down the pass, was reached late in the afternoon. Owing to the blinding snow the telegraph lines for the last mile could not be seen, but on the

following morning it was inspected, the fault found and communication restored.

'It was thought that snow shoes should prove of use for telegraph work in Kashmir, and the Director, Construction Branch, had different patterns, including the Norwegian Ski, the Canadian and the Convoy, supplied to all the officers. They have not, however, proved of much value so far, at any rate over soft snow. The steep ascents and descents tend to preclude their usefulness, and it seems that long training is necessary before men will take to them.'

It is hard to predict, an Indian adage goes, what a King, or a bugle or a monkey would do next. Indian Telegraph Department's control over the Kashmir State system has had a chequered career. It came and went, and sometimes it came partially or went partially. Mr M. L. Pasricha, a retired Senior Officer of Posts and Telegraphs, recounts some amusing experiences regarding the Srinagar-Gilgit line. In 1912-13, Mr Pasricha was inspecting the State lines. Maharaja Pratap Singh had suggested that the lines over the Banihal Pass, subject to frequent interruptions, should be insulated with guttapercha. 'I was taken to task', recalls Mr Pasricha, 'by the then Prime Minister of Kashmir, Dr A. C. Mittra, for trying to contradict the royal knowledge by claiming that the insulation of a line with guttapercha was not the solution.' Another instance. The Maharajah's brother, H. H. Amar Singh, was in charge of the Telegraph Department in the State. The line over the Burzil Pass was giving unending trouble. Amar Singh had 'a wonderful original idea' of laying cables over the Pass in place of the overhead route. The cable consisted of 600 lbs. iron wire insulated with birch-bark. Says Mr Pasricha: 'It failed to work even for a single day'. But it must be said to the credit of the State authorities that Kashmir had evolved an Urdu Morse from the very early years to supplement messages in English, especially between employees of the State.

The Maharajah's wish to keep his State as isolated as possible, by resisting railway links or an airport, was to boomerang. The day of reckoning came on October 22, 1947, when 2000 sharp-shooting tribesmen entered Muzaffarabad at dawn. On 27th October, Baramula was occupied. Only 24 hours stood between the tribesmen and Srinagar. Had it not been for the communication lines grudgingly accepted by its rulers, and had it not

been for the dusty landing place (the Maharajah had opposed a modern airport) where valiant Indian troops landed in the nick of time, history would have been written in a different way.

All the circuits to Kashmir previously worked *via* Lahore and Rawalpindi and with partition and Kashmir invasion all contact with that State was lost. It was a major problem that post-partition India had to face. The first step to provide tele-communication to the cut-off State was by the installation of wireless transmitters at Jammu. These transmitters worked with Amritsar and New Delhi. The line from Amritsar to Pathankot was strengthened and additional carrier equipment installed. A new route from Pathankot to Jammu was constructed in record time even though there was no regular road between the two places. A new route from Jullundur to Pathankot *via* Mukairian has eliminated unnecessary length of circuits.

ON THE EVE OF AUGUST 15

Before the Partition, on March 31, 1947 the picture looked:

Lines and Cables—

Post Lines	117,201 miles.
Wires copper, iron and bronze	769,036 miles.
Cables, aerial u/g, submarine	5,259 miles.

Telegrams—

Total No. of telegrams :—		
Press		944,107
Ordinary		242,990
Revenue	Rs	7,64,65,000

Phonograms—

Booked		945,553
Delivered		358,689
Revenue	Rs	118,200

Telephone connections—

No. of Departmental exchanges	407
No. of Departmental telephone connections	93,426

Private and PBX systems—

No. of exchanges	2,229
No. of telephone connections	29,723

Licensed telephone company system—	8
No. of exchanges	1,359
No. of telephones including non-exchange telephones	2,644
Combined Total No. of exchanges	1,26,964
Combined Total No. of connections	4,672,976
Total No. of trunk calls	

Telephone Revenue—	Trunk Call fees	Royalty from Companies
Telephone Rental		
Rs	Rs	Rs
3,45,81,600	2,40,38,800	33,700

THE PARTITIONED LINES

In undivided India, Lahore was the main telephone and telegraph centre for the North. All the main lines were connected to this place and the branch lines even to places which are now in East Punjab, radiated from there. As a result, at the time of partition, it was found that not only towns on the Punjab border but even larger places like Jullundur and Amritsar had to be reached through Lahore. This was undesirable from the security point of view. The first work in this area immediately after Partition was, therefore, to provide tele-communication circuits to all these places by routes passing entirely through the Indian territory.

Arrangements were made for terminating the circuits at Amritsar and Ferozepore and for providing suitable carrier equipment at these places. The branch lines which were previously working with Lahore were re-arranged to work with Amritsar, Jullundur or Ferozepore. A direct trunk telephone link to Jammu was also built up. A number of wireless transmitters were installed to meet the requirements of the out-of-the-way places. All this work was naturally to be carried out with a high priority and was completed within a matter of days.

Same were the difficulties on the Eastern side where all circuits to Assam, Northern Bengal and the State of Tripura which had acceded to India passed through East Pakistan. To relieve the situation wireless stations were opened up first at Agartala in Tripura, Gauhati in Assam and Darjeeling in the Himalayas. The installation of the wireless station

at Agartala is a minor epic in itself. Those were the days of the Kashmir invasion and suddenly it was found that no messages to Tripura were going through. It was decided that immediate contact should be established. A Dakota left Calcutta with a full load of wireless equipment and landed in Agartala—perhaps the first large plane to land after the cessation of the second World War on this American-built aerodrome—and it was within forty-eight hours that Tripura was on the air.

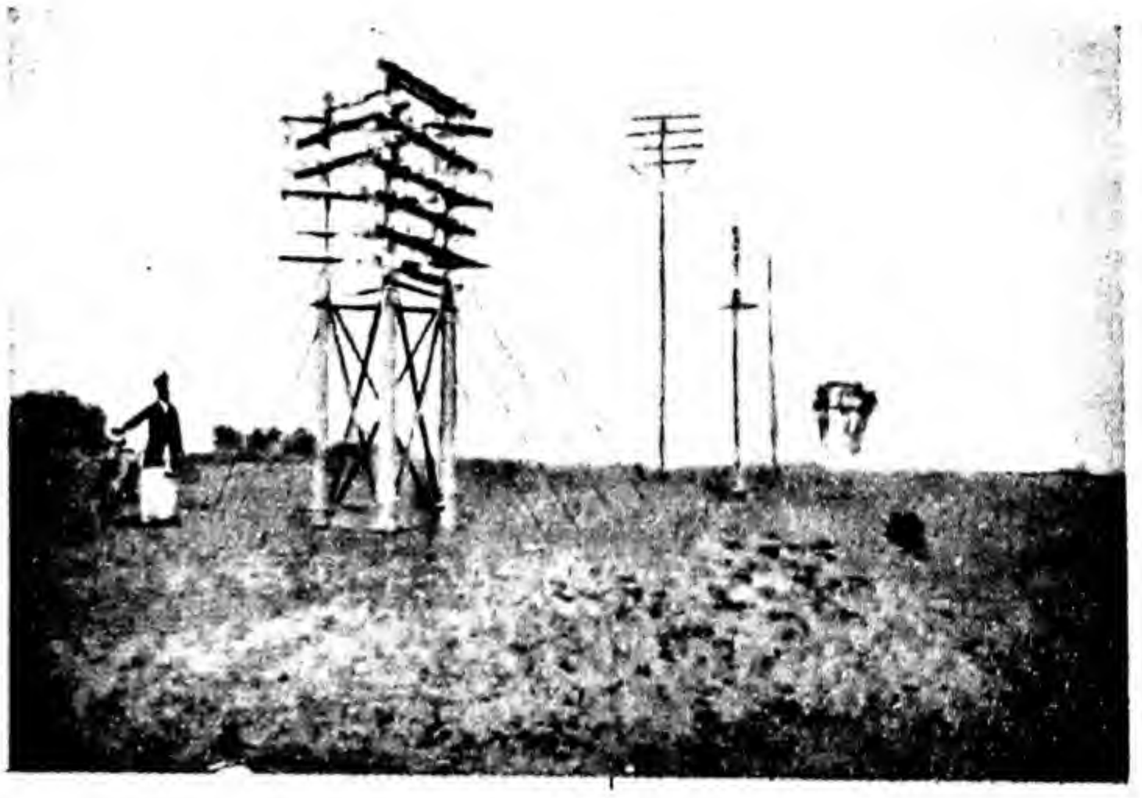
Subsequently a land line was built from Patna to Gauhati through the Indian territory in the record time of four months. This line was constructed in the face of tremendous difficulties, over the water logged fields of Bihar where men had to work for hours waist-deep in water, to the difficult Terai region of North Bengal and Assam where almost every post had to have concrete foundation to prevent them from being washed away during monsoons. The Telegraph engineers can proudly say that they were the first to be in this difficult country; for the Assam Tele-communication Link was already there when construction started on the famous Assam Rail Link. All this stupendous and extremely emergent work in the post-partition days was accomplished in record time by a daring band of Departmental workers, purely Indian, led in the north by Messrs Jagdish Prasad and B. D. Sud, and in the east by Messrs R. C. Vaish and Sudhir Kanjilal.

THE AFGHANS AND INDONESIANS

The post-independence period is marked with especially warm fraternal relations between India on the one hand and Afghanistan and Indonesia on the other. The political ties were strengthened by wireless links. A direct wireless telegraph service between India and Afghanistan was established on January 9, 1950.

Wireless Telegraph Service between Indonesia and India was opened on October 2nd 1950. President Rajendra Prasad of India greeted President Soekarno of Indonesia, and *vice versa*. India had played a notable part in assisting Indonesia to regain its freedom from the Dutch, and several of the top leaders of that country have been long-time friends of Prime Minister Nehru. Silken bonds of love and regard existed between these two Asian nations. New aerial cords were added.

President of India inaugurating the India-Indonesia Radio Telephone Service on the 11th October, 1950.



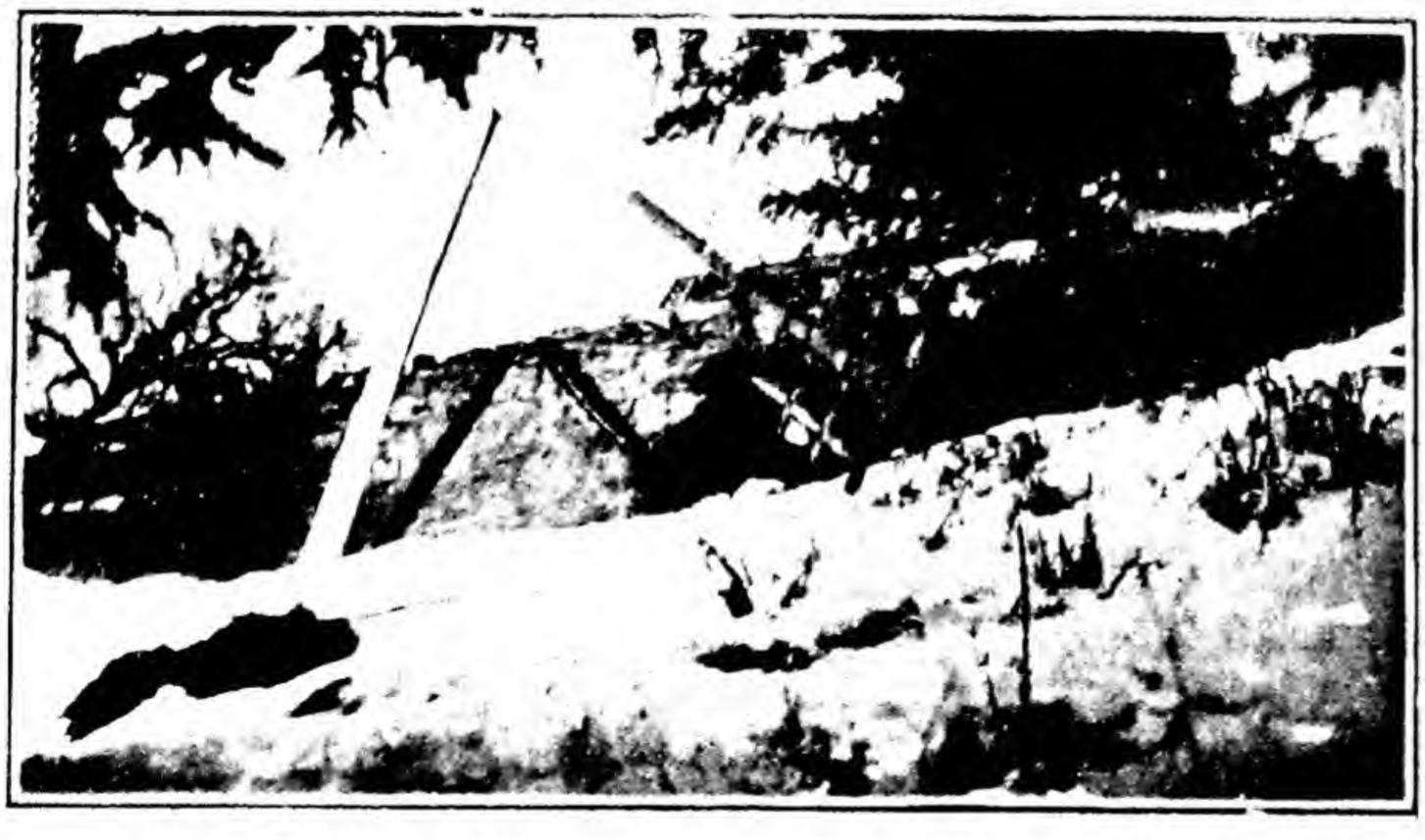
Majdoors transporting a coupled post—A coupled post being erected—An erected tripod.

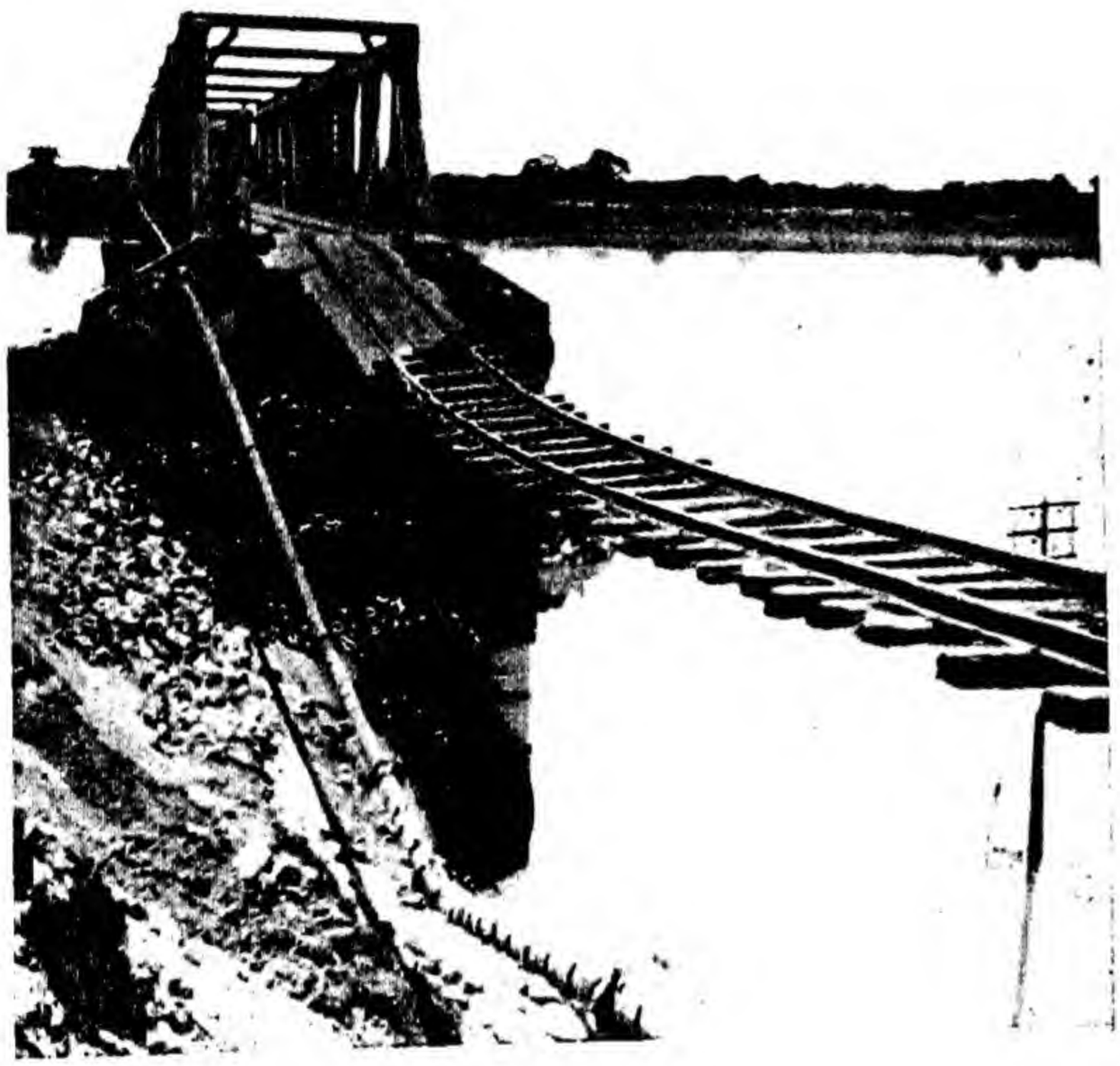
Bombay-Calcutta line on huge masonry bases constructed in the bed of a river near Bhusaval.

Prime Minister inaugurating the Delhi-Jammu trunk circuit in December 1947

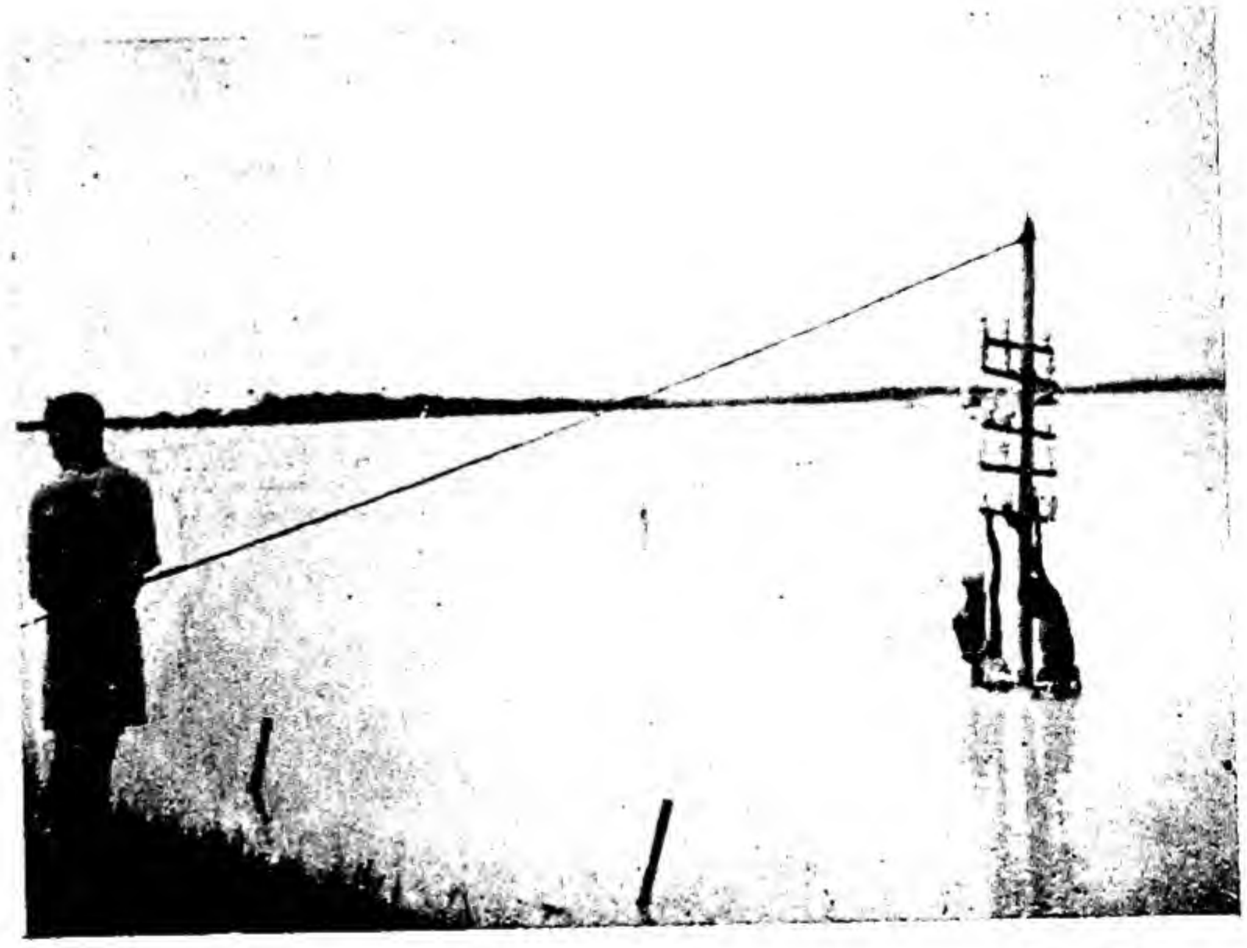
Guarding Telecommunication lines at high tension power lines crossing

Damage to telegraph lines by snow

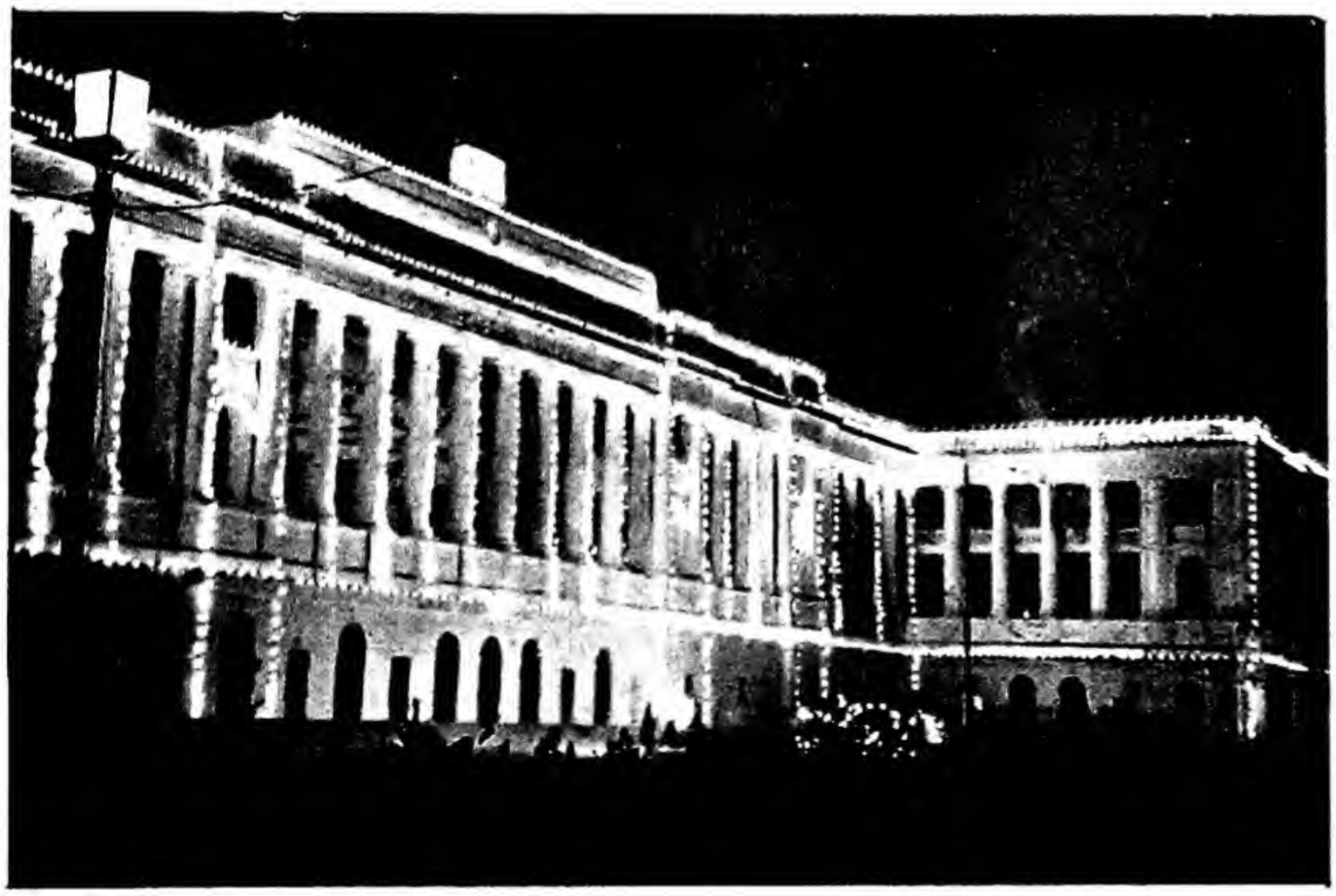




Damage to telegraph lines due to flood



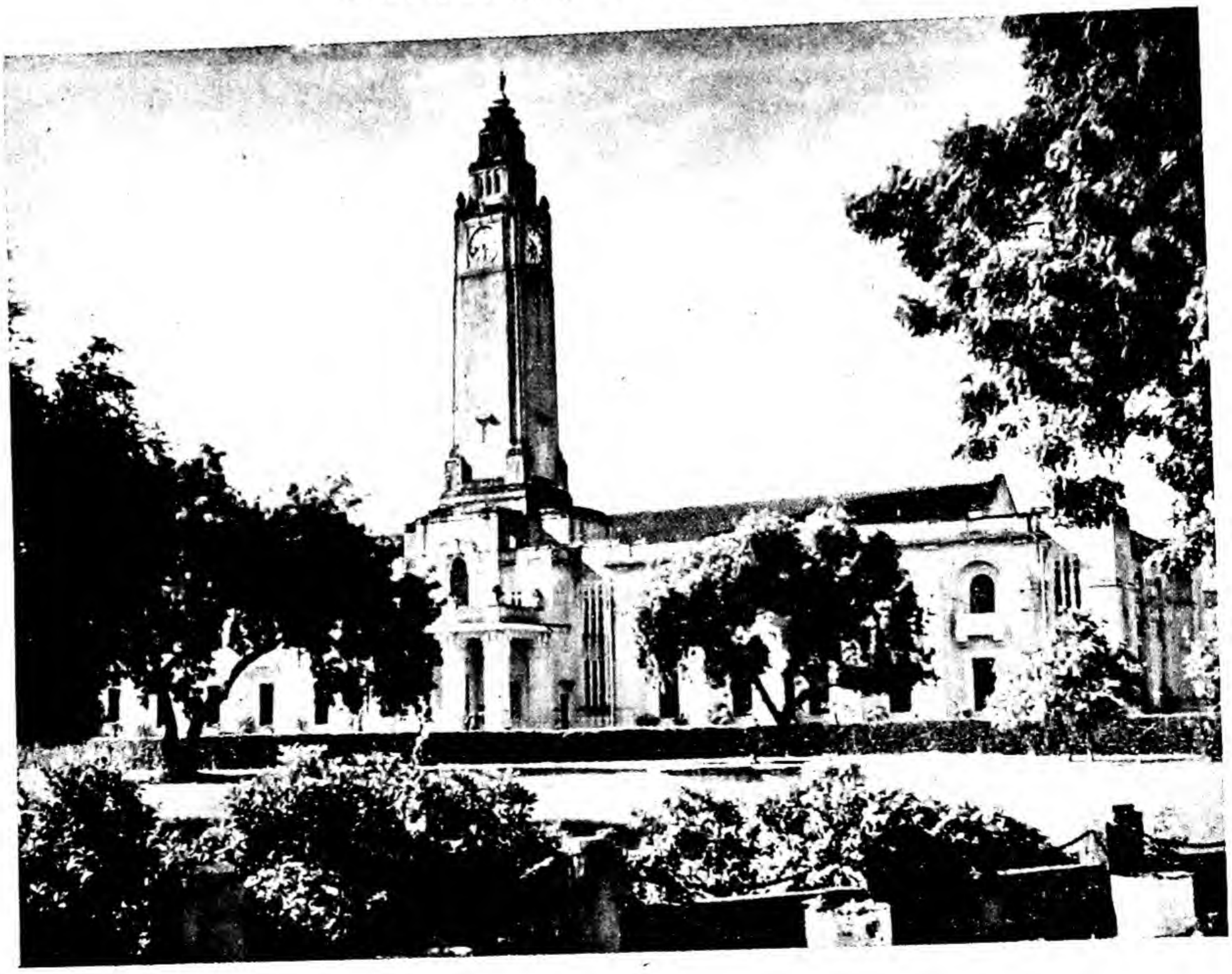
Sardar Patel, Deputy Prime Minister, performing the launching ceremony of "Jalaprabha", a ship belonging to the Scindia Steam Navigation Co. Sardar Patel is seen pressing the switch which was connected by Trunk Carrier System to Visakhapatnam and on its pressing the ship was launched and sent down the slipway of the Scindia Steam Navigation Company's Shipyard



Central Telegraph Office, New Delhi, illuminated on the night of January 26, 1950, First Republic Day

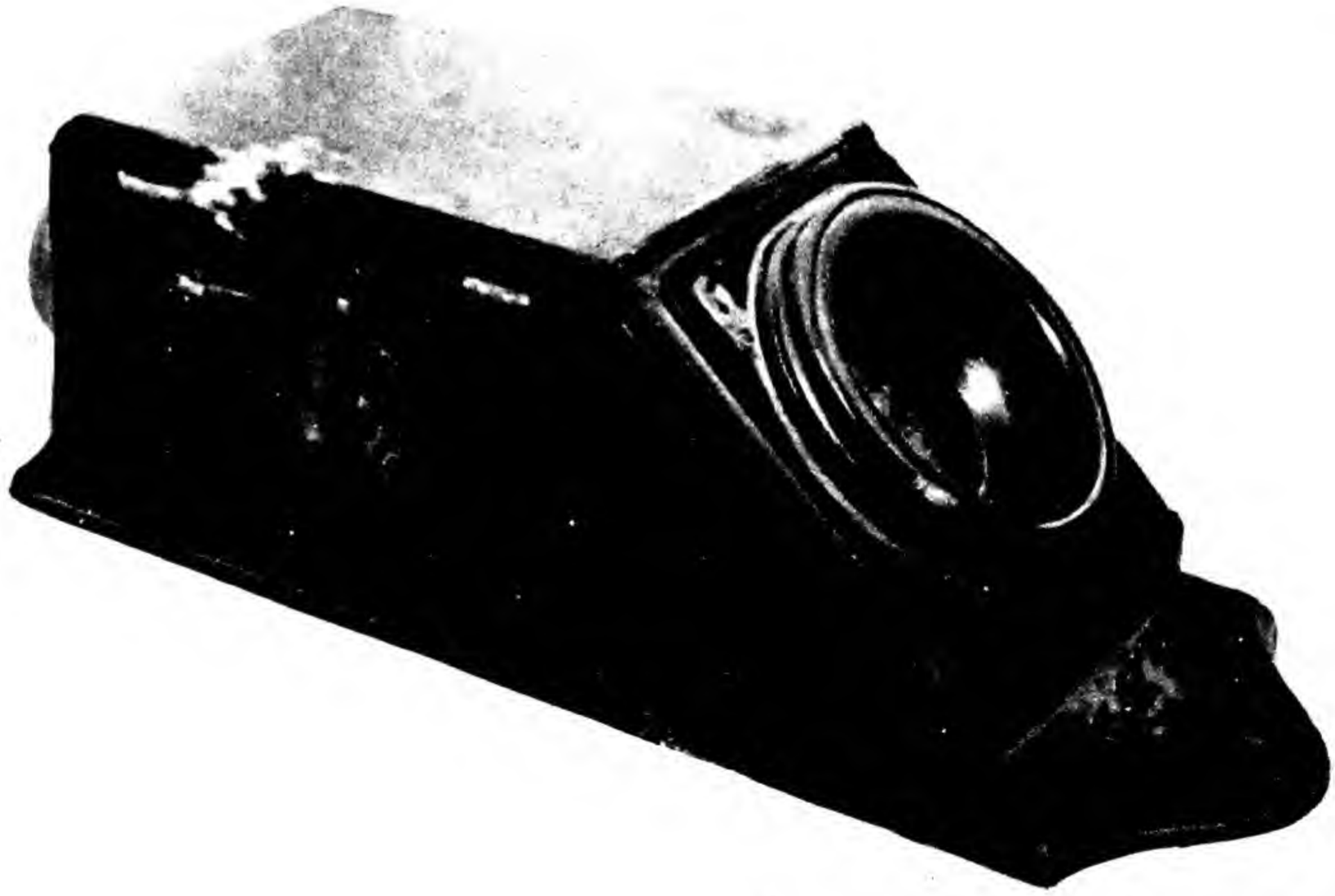
Central Telegraph Office, Bombay.

Central Telegraph Office, Lucknow.



Damaged telephone cables—lead sheath eaten away by insects.

An old type of telephone receiver with wooden body.



Old pattern view wall set (Front of Transmitter).

III. Arteries of 'Expeditions'

QUITE A SUBSTANTIAL part of telegraph development in India has been due to the various military 'expeditions', north, south, east and west, now in Afghanistan, now in Sikkim or Assam, now in Burma, or again beyond the tip of India to Ceylon. India is not alone in this respect. The history of communications all over the world is tinged with military exigencies.

But why single out communication alone? Science, technology and medicine make greater strides under the pressures of war than during the relaxation of peace. Civilians rise to greater heights of sacrifice during war than in peace. Fear is regarded by anthropologists as the father of religion. Even human unity is inspired more by common funk than by the vision of a future promised land.

Necessities of military action drew the best out of not only the generals and soldiers, but also out of engineers and linesmen. Often enough it was impossible to determine who was more responsible for victory and which class showed greater courage and inventiveness. In the hills and in the jungles, on shifting fronts, telegraph working parties had to carry arms and observe army discipline, and often use them in self-defence. The lineman's heroism was also invoked by natural calamities such as floods and earthquakes. It was a struggle alright, either against man or against nature. And it was as the second line of defence that the Indian working parties built the highest telegraph office in the world and strung the highest line in the world.

TELEGRAPH'S PROBLEM PROVINCE

Assam is the Problem Province of the Indian Telegraph. The hazards connected with that mighty adventure are narrated by an old timer with unusual frankness.

From 1863, the telecommunication service in Assam catered to the needs of the British Administration, narrated the old timer. The country itself had hardly any roads other than foot paths, which the British converted at places into cart roads. The only reasonably comfortable mode of conveyance was bullock carts which took you 5 to 10 miles a day.

With the passage of time the lines and wires were erected through thick forests, marshes, hills and dales. They traversed both banks of the Brahmaputra and its valley, crossed the Borail range at a height of over 6,000 feet. Lines and wires were erected 75 years ago through the most difficult country from Rangamati to Lungleh in the Southern Lushai Hills and from Silchar to Aijal and Sairong. Lines were erected along the present Lohit valley road to Therialong on the China Border 40 years ago, and also from Sadiya to Pasighat *via* Nizamghat, a most difficult terrain. Further lines were erected from Kongnyu to Wakching and from Silchar to Imphal *via* Jirighat and Bishenpur; of these the first was abandoned in 1920 and the latter in 1903. Lines were erected from Imphal upto Tamu in Burma before the road was built. Subsequently, telegraph lines were erected along with the construction of the railway. It is a matter for wonder how the construction of these virgin lines was possible without proper modernised conveyance. They were constructed by 'our men who were all Indians under the supervision of the British'.

It is also surprising to think how these lines were maintained. For annual maintenance, naturally greater number of men moved together. But for removal of interruptions and for periodical patrols, the number of men employed must have been comparatively smaller. It must have been 'a task beyond imagination for a man to cross uninhabited stretches of land through marshes, forests abounding in animals, across hill streams, with danger from hostile tribes'.

While in service there were instances of loss of life or accidents some of which are noted below, but this did not destroy the morale of the staff:

Mr Mellvilo, Superintendent of Telegraphs, was killed during an uprising in Manipur on March 26, 1891, 31 miles from Imphal, when he was returning after inspection of line to Tamu. Mr O'Brien, Signaller, who was accompanying Mr Mellvilo, was also killed at the same time. Nandalal Upadhyaya, a lineman, was drowned in Teesta while shifting lines during erosion at Barnes Junction. One Kantaram, a lineman at Kobo, was mauled by a tiger

in his hut. He died. One Jaman Singh, a lineman stationed at Tamu in Burma, was killed by a Kachin.

Bipat Kurmi, a lineman, fell down from a tree while on interruption duty and broke his spine, in Kachugaon Reserve Forest. He died after several months. Ibrahim, a lineman, while shifting the terminal post during erosion of the Aio river, met with an accident which caused his permanent invalidation. Gonpotram, a Sub-Inspector, broke his ribs and leg bones while working at terminal post in Gauhati, only a few months before his superannuation was due. Narayan, a Sub-Inspector, while travelling in a ballast train on duty was involved in a collision of the train and broke his spine.

One of the reasons for superb service in the Department by the subordinate staff was the method of recruitment. "Recruits were drawn from families of tried loyalty to the Department, which in the present day is considered as 'Nepotism'. Even upto the twenties of the present century, whenever a member of the line establishment from Bihar or up-country went on leave he was asked officially to select and bring with him suitable young men for enrolment in the Department. If an analysis of the staff is made, it will be found that people of Oudh and of Arrah and Muzaffarpur in Bihar mostly adorned the Line Establishment in the entire North of India from Karachi to Imphal in Assam upto about 1930". The Engineering Supervisors were recruited from Telegraphists, and, when found unsuitable, were reverted to their substantive posts. Confirmation in the posts of Supervisors followed a strict practical test. The men were not always of high academic standards, but they knew they had only to act according to the codes and orders.

'Late Sri M. M. Nag and several others succeeding him in Dibrugarh had to be admitted into the hospital for treating ulcers due to leech-bites every time they returned from interruption or inspection of the line from Sadiya to Passighat *via* Nizamghat. During inspections, the officers not only observed the broken insulators or jungle on the line, but used to notice one or two inches of deviation in the spacing of brackets, short or overburial of sockets, and such other minute items. Every item of stores lying at any place whether serviceable or unserviceable had to be noticed. Leaving any irregularity unnoticed was viewed seriously by the next higher officer inspecting the area.'

THE LOOSAI EXPEDITION

Loosai Hills were astir; at least, the British rulers thought so in September, 1871. The Commander-in-Chief called upon the Telegraph Department to do its duty. Lines should precede the troops in the Loosai country. The suggestion was to construct lines of a semi-permanent character from Silchar to Tepai Mookh and Chittagong to Demagiri. From those two outposts, flying lines were to be projected to such advance posts as the Commanders in the fields would consider desirable.

The wire used was of iron weighing 300 lbs. to a mile. It was supported on bamboos, and insulated with small field bracket insulators. In most places the wires were suspended from trees, as much of the country was covered with dense jungle and forest. Posts were dispensed with as often as possible. For temporary connecting lines, copper wire of No. 16 Birmingham gauge was utilised. Morse Sounders and modified Daniel Cells were specially fitted up for portability in battle field which was chronically fluid.

The line from Companygunge to 'Chuttuck,' some 8 miles, was completed on the 16th November, within a couple of days of the receipt of wire from Calcutta. The line was maintained till the close of the expedition, and the men in command were grateful for its contribution toward military success. For instance, the Expedition history records that there was an 'outbreak of cholera among Captain Hidayat Ali's Coolies,' which was promptly controlled because of the medical aid that was soon available on account of telegraphic communications; otherwise, the 'arrangements for the operation of the Left or Cachar Column would in all probability have fallen through.'

The country was very hilly, and, offered enormous natural obstacles to the rapid construction of a line. The jungle clearing was very heavy. Wrote Pitman, the officer in charge of the Telegraph construction party: 'In the first instance, a track 24 feet wide and 1,136 feet long was cut through a *khud* covered with dense bamboo jungle, that is, 3,030 square yards of bamboos had to be cleared away before the wire could be strained up. In the second instance, when spanning a piece of forest jungle, a track 1,322 feet long and 23 feet wide was cut'.

TENTACLES TO KABUL

The latter part of 1878 saw the first Afghan War started prior to the treaty of Gundamuck. To facilitate the 'expedition,' telegraph lines were

constructed hurriedly in Kurrum Valley, Kandahar and Khyber Pass. These lines were often disturbed, spans of many miles being stolen away by 'the enemy'. Military patrols, besides fighting, had to protect the lines while often enough the line constructing party fought the enemy courageously, under trying circumstances.

UPPER BURMA

A call came in October 1885. The Indian Telegraph Department was asked to organise a service, in connection with the expeditionary force to Upper Burma, which would keep the advancing army in telegraphic communication with Rangoon. This was the operation that resulted in the capture of King Thibaw and Queen Supaya Lat and their forced trip to India, the former to die in Ratnagiri on 16th December, 1916. Early in November a telegraph party, fully equipped, was ready at Prome to accompany the soldiers. This party proceeded with the expedition to Mandalay, while another advanced across the frontier by land as soon as a small escort could be secured. Communication with Mandalay was established on the 11th December, and intermediate offices were opened on earlier dates as sections of the line were completed.

The old Burma telegraphic line of King Thibaw's vintage was found to be in a far worse condition than was anticipated, and after the preliminary repairs needed to open emergency communication were completed, it had to be entirely remade. The difficulties met with were considerable, the weather was unpropitious, and the country in part inundated, while the working parties, as well as the line itself, were subject to constant attack by the Burmese guerrillas. Recorded memories of linemen include an interesting item. In several cases when the Burmese were approached to provide milk for tea, 'mother's milk' was given as there were no cows nor goats. Notwithstanding the frequent harassing destruction of wires and posts and the difficulty often experienced in obtaining escorts for repairing parties, all repairs were rapidly effected and communication with Mandalay maintained throughout the campaign.

Simultaneously with the operations along the Irrawaddy, the telegraph was extended beyond Toungoo on the eastern frontier, and before the end of the year an office was opened at Ningyan.

Burma became an occupied province. The telegraph office opened by

31st March, 1885, in 'the recently occupied province' were:

Name of Office	Date opened
Minhla	25-11-1885
Sinboungweh	6-12-1885
Pagan	7-12-1885
Myingyan	10-12-1885
Mandalay	11-12-1885
Yenangyaung	19-12-1885
Toyngdwingee	23-1-1886
Ava	30-1-1886
Moytha	31-1-1886
Zaygyo	1-2-1886
Kyaykmyaung	20-2-1886
Shwedo	22-2-1886
Gyobin	26-11-1885
Ningyan	29-12-1885

In December 1885, serious local disturbances in the Shwegyin and Pegu Districts called for very energetic efforts at the upkeep of the lines which were extensively damaged, both posts and wires having been cut up before peace was restored. The Government of India, therefore, in a Gazette Notification expressed its appreciation of the victory value of the work done by Telegraph Department.

Mr N. N. Banerjee, one of the first Indian Officers to be recruited in India and who retired as an Officiating Chief Engineer of the Department, was deputed at the age of 22 in 1908 'to construct a telegraph line between Victoria Point and Maliwun, a stretch of about 30 miles through the virgin forests of Burma.' 'I was virtually the leader of an expedition consisting of 150 line construction coolies, a dozen Sub-Inspectors and linemen complete with 3 months' ration and half a dozen elephants.' It took them four months to construct the line, while in the Indian plains it would have taken 'only a week or ten days.' Mr Banerjee's main adversary was the elephant. 'At least twice a week the elephants would come, and destroy the line along a half mile stretch which apparently they considered as their own country.' As a

matter of fact, the depredations of the elephants were so persistent that the line had to be abandoned after about twelve years. What the elephants especially liked was the use of the telegraph poles as 'scratching stations'. Somebody had a bright idea; poles were encircled with barbed wire. The elephants enjoyed that all the more.

TO HAZARA WITH 'LIGHT LINES'

The Indian Telegraph Department was not only serving the public during peace, it was helping the army during war. This was not all. Even through the campaigns it tried various experiments with materials and apparatus to suit emergencies.

The Hazara campaign of 1888, for instance, gave birth to the 'Light line'. The use of field cable for the purpose of rapidly establishing communication when time would not admit of even the lightest aerial line being erected sufficiently quickly, was being discovered. Good use of this cable was made in following the troops in the advance up the Black Mountain and also up to Thatkot and to the Allai country. Without the light cable it would not have been possible for offices to have been opened at the end of the day's march. Mr Barker, the innovator, wrote: 'The cable has proved invaluable; 20 miles a day could easily be paid out were it not that marching with a column on a mountain road it is not possible to get the transport along quickly enough and so delays occur in getting up the cable from the rear or wherever it is blocked. I generally carried five or six miles by coolies and as their loads were expended sent them back for more to the mules or camels. I was always able to keep up with the column!'

A light line thus lying on the ground or spread over trees was much exposed to injury either from pack animals breaking it or from its being stolen or cut, and one of the lessons learned in Hazara was the importance of replacing it as quickly as practicable by air line to be erected by a party following up the advance guard.

Another experience gained was in connection with field telegraph posts. A post made of wrought iron in four pieces all fitting inside each other like a telescope, 18 feet in height and weighing 40 lbs, had by then been designed to carry two light iron wires. A large number of these posts were used in the expedition. The reports on their portability, lightness and strength were encouraging. In the reconstruction of the line from Haripur to Derband,

the number of posts required for a mile of line were loaded on one camel, and they were expeditiously and easily distributed over very rough ground. 'Coolies' could handle them easily and carry them to points where animal carriages could not proceed, and the pieces could be fitted together without any difficulty on the site. 'The best pattern for a field telegraph post,' commented the Report, 'has always been a difficult question. Bamboos are only procurable in certain localities and they are also unwieldy unless cut into short lengths that can be fitted together. Wooden posts are also often unprocurable and their weight is against them. In the new pattern of iron posts now made up in the Departmental Workshops at Calcutta, it is believed that we have solved a troublesome problem, as the test to which the posts were put in the Hazara expedition is not likely to be exceeded in severity in any future campaign.'

'FLYING LINE' TO CHIN

The Chin Expedition of 1888 involved the erection of 70 miles of 'flying telegraph lines'. The first section from Kalewa to Kambale, 28 miles, was completed on the 26th of December and an office opened at Kambale. A branch line from Kambale to the 2nd Stockade was completed by the 13th January and another branch from Kambale to Sihong, 28 miles, was completed by the 23rd February 1889. There was some inevitable delay in effecting these communications, owing to the absence of escorts, sickness, and the difficulty of procuring carriage and labour at a time when every thing of the kind had been requisitioned by the military authorities. As a proof of the utility of the telegraph, it may be mentioned that during the five months from the 28th December to the 28th May, over 8000 telegrams passed through the Kambale office, 'many of them long press messages.' The Indian press had by this time become a camp follower.

THE HIGHEST IN THE WORLD

During the Sikkim Expedition of 1888 the highest telegraph office in the world, perhaps even now, at Bhutong, two miles on the Tibet side at 13,500 feet, was opened and operated successfully from 12th November to 6th December, 1888.

Fifteen years passed. In connection with the movements of the Sikkim-Tibet Mission, a second wire was erected from Darjeeling for 17 miles,

as far as Teesta Bridge, along the existing Darjeeling-Gangtok line, and an office was opened on the 11th June 1903 at Teesta Bridge, whence an alternative direct line with one wire was constructed, *via* Rungpo, to Gangtok, 32 miles. An office was opened at Rungpo on the 21st June 1903. The Line was continued from Gangtok northwards for 95 miles to Khambajong, 15,722 feet above sea level, which was reached on the 13th September. The highest altitude over which this line passed *en route* to Khambajong was 17,500 feet, which is believed to be the highest ever reached anywhere by a telegraph line. Field service conditions and army discipline applied to the telegraph staff accompanying the mission.

A temporary line, which was being erected between Siliguri and Teesta Bridge, 29 miles, for the convenience of the working parties employed on the construction of the new cart-road from Siliguri to Darjeeling, was ordered to be made permanent, a second wire being at the same time added for the use of the field telegraph. This work was completed on the 16th December, 1903, and the second wire extended to Rungpo, 14 miles, in four days. The Mission was then withdrawn from Khambajong on the 11th December and moved into the Chumbi valley. Due to transport difficulties, 61 miles of the line from Khambajong towards Gangtok had to be abandoned.

It was found necessary to link up the Mission with stations in the Chumbi valley, so field telegraph lines were erected from Gangtok to Tune, 90 miles *via* Chumbi and Panjong after crossing the Tang La at a height of 15,700 feet; and from Gangtok to Changu a distance of 20 miles, and thence to Chumbi, a distance of $15\frac{1}{2}$ miles, across the Nathu La providing an alternate route between Gangtok and Chumbi.

At the close of 1902 the Sikkim-Tibet Mission field telegraph comprised 223 miles of line, 315 miles of wire and 15 offices. During 1903, 72 miles of line, 101 miles of wire and ten offices were added, while 70 miles of line, 200 miles of wire and 19 offices were reduced, leaving a balance of 216 miles of single wire line and six offices. From the 15th November 1904 the system ceased to be a military field telegraph system.

FLOODS, FLOODS EVERYWHERE!

Heavy floods assailed East Bengal and Assam in August 1906. At Sara and Damukhadia, the flood water topped the banks of the Ganges and the cable house at Damukhadia was washed off its mound. The Brahmaputra

and Surma valleys were inundated to such an extent that telegraph posts in the plains were submerged two to nine feet in water. Communication between India and Burma *via* Assam was interrupted through the collapse of a large span near Bagribari owing to the rushing waters. When the span was re-erected it was found that the cables across Brahmaputra at Jogigopa were destroyed and all attempts to communicate through them with the aid of vibrators and syphon recorders proved futile. Restoration of communication took about four months.

1924 was the year of deluge, and the Director General of Posts and Telegraphs had to act as a veritable Noah. In the north, the greatest damage to Telegraph lines occurred between Bharatpur and Jaipur, Delhi and Ghaziabad, Ambala and Saharanpur, Saharanpur and Bareilly, Ghaziabad and Moradabad, Aligarh and Bareilly, and Burma on the east coast. Temporary arrangements were made for the disposal of accumulated telegrams; the line staff rose to the occasion and showed commendable devotion to duty in the face of suffering, privations and hardships.

South India suffered even more extensive damage to its communication lines, necessitating a special grant of Rs 1,10,600 for repair and the reconstruction of several buildings which had been washed away. Several officials of the Department lost the whole or great part of their property. As a matter of immediate relief, an advance of three months' pay was granted to those affected, recoverable in twelve instalments. Further a 'Madras Posts and Telegraphs Relief Fund' was opened to which voluntary subscriptions and donations poured in. Charity, fittingly, began at home.

There was a cyclone to boot in the Madras Presidency, which enormously added to the damage of the telegraph lines in Trichinopoly and Bangalore areas.

IV. Step by Steady Step

IMPROVEMENTS came gradually, but surely. The expansion of the telegraph service was in proportion to the Government's needs and the public's demands. Amenities and facilities to the public multiplied, step by step, as the science and technology of telegraphy made progress abroad as well as in Indian laboratories. New features were introduced as soon as they were invented in Europe or America or in the Calcutta workshops. The main hurdles pertained to India's limited purse, and to the absence of skilled workers and trained managerial personnel. This limitation was keenly felt especially in the beginning. But the increase in the number of facilities came as man's need to pack a week in a day became more pronounced. Imagination came to the rescue.

The difficulties were not merely 'physical' in the formation of the early telegraph lines in India. More serious handicaps pertained to the personnel. An entire establishment for the working of the lines had to be formed from the commencement. O'Shaughnessy had to take up the job of 'the sudden and simultaneous training of some 300 persons, employed in sixty different offices.' And while the signallers were generally 'experts and capable of manipulation,' yet in respect of steadiness and other requisite qualities there was 'both room and need for great improvement.'

'EQUAL' TO AMERICA

Criticism was not wanting even in those pioneering days. There were allegations of inaccuracy, and Dr O'Shaughnessy had to take up the cudgel. 'I can further establish by facts and official records beyond dispute,' he wrote to Lord Dalhousie, 'that the Indian lines have already accomplished performances of rapidity in the transmission of intelligence, which equal that achieved on the American lines'.

'We have repeatedly sent the first bulletin of over-land news in 40 minutes from Bombay to Calcutta, 1,600 miles. We have delivered despatches from

Calcutta to the Governor-General at Ootacamund, during the rainy season, in three hours, the distance being 200 miles greater than from London to Sebastopol. We have never failed for a whole year in delivering the Mail from England *via* Bombay within twelve hours.' The record was so good that Lord Dalhousie had no hesitation to 'bear testimony to the accuracy and rapidity with which the telegraph worked.' The Hon'ble Court permitted 'Superintendent' O'Shaughnessy to proceed 'a second time to England and to America to obtain the means of improving our present system and of extending it still further'.

AN ANNA A WORD

Indian coins or currency are not based upon the decimal system of enumeration. The anna content of a rupee is as arbitrary as the pie content of an anna. A people's method of counting effects their way of living in many imperceptible ways; there is a whole pseudo-science of numerology. Here is an instance. There are sixteen annas to a rupee; there were sixteen words to the unit of a telegraph message when the system was thrown open to the public in 1855. And they charged only one rupee per message of sixteen words over a distance of 400 miles, an anna a word.

An innovation was introduced in 1866. The unit of length of a message was increased to 20 words. Half and quarter zones, 200 and 100 miles each, were established. For a 400-mile zone, the rate was Re 1 As 8 with an additional charge at the rate of annas eight for every ten words. A message of 20 words across 100 miles cost the sender eight annas, while a similar message across 200 miles cost Re 1. There was also a levy, irrespective of the length of the message; the booking fee for every message was eight annas.

Again a change came and a major one which lasted upto 8th January 1872. The conception of charging on the basis of distances was given up. The unit of length of a message was reduced to ten words but the charge was made uniform all over India. Whether a telegram was sent from Calcutta to Patna, or from Calcutta to Peshawar, a ten-word message cost uniformly Re 1. An added relief was introduced in 1870; every three words in the address were counted as one. However, this generosity proved to be uneconomic.

So, in January 1872 the whole thing was revised. Six words were made the basic unit and the address began to be admitted free. The universal charge within Indian borders was Re 1, while a 50 per cent. extra charge was demanded for telegrams going to Ceylon and Burma.

CUT-RATE COMPETITION

That was inside India. In the foreign field, rates had to be revised and re-changed according to the intensity of struggle among rival companies. When, in 1868, the rate between London and India by the Indo-European line was reduced to £2-17*s* for a message of 20 words, the prospect of the establishment of the cable route *via* the Red Sea was still remote, and it was believed that the increase of traffic would in time more than compensate for the reduction in price. The Indo-European Company, which had constructed a reliable line between London and Tehran, was organised at a time when the tariff to India was £5 for a single rate message, and its supporters had come forward on the understanding that a rate of at least £4 would be continued. The decision of the Conference of Vienna compelled them to try the reduced rate of £2-17*s*, and this reduction had a considerable effect on the Company's share of the gross charge. The successful laying and working of the Red Sea cable was not anticipated when the Company started; nevertheless, a full trial was given to the experiment of working with a low tariff, and the result proved it to be in the highest degree unremunerative.

The procedure adopted by the competitor Companies was however irregular, and it was considered by the Indian Posts and Telegraphs to be illegal, according to the terms of the Vienna Convention. Moreover India was feeling that it was not getting its due share of international revenue from foreign countries. To settle this point, and also to consider the possibility of assimilating the rates by all routes, a special Sub-Conference was convened at Berne, at which delegates from the countries interested in the subject, including India, met to discuss the question of the Indian tariffs. India was represented by Colonel Robinson and Major Champain. It was customary in those days for India to be represented on international bodies by Englishmen, and let it be said to their credit that they always upheld Indian interests unless they clashed with those of Britain. Although the Indian enterprise did not get all it asked for, it received certain relief. For, representatives from all the Companies, although not permitted to vote, were invited to be present, and had full liberty to take part in the discussions.

A formal Conference at Rome followed in December 1868. Further changes were introduced in the system of tariff, but they did not come into force until the 1st July 1872. The general result of the Conference was a

simplification of procedure, and again for the public because of largely increased facilities.

The total Indian revenue from international traffic had increased from Rs 327,567 in 1870-71 to Rs 455,851 in 1871-72, a result which was accepted at that time as fairly satisfactory.

ACHIEVEMENTS AROUND 1870

A comparison of Indian operations with those of other countries around 1870 is revealing. An examination of the statistics of all the administrations of Europe including Russia but excluding Great Britain, showed that India stood:

4th in ordinary expenditure and length of line,

5th in revenue, length of wire, number of employees, and number of offices (including railway offices), and

13th in the number of messages transmitted (excluding the number despatched by railway offices, of which at that time there was no record, but which were included in many of the foreign returns).

The following tabular statement indicates the yearly aggregate receipts and expenditure of the Department for the five years ending 31st March 1873:

	1868-69	1869-70	1870-71	1871-72	1872-73
Receipts .	12,64,800	12,54,280	13,14,880	15,86,220	17,68,835†
Expenditure	51,57,692	35,78,286	30,27,857*	39,47,061*	39,20,840‡

During all this period, the Department spent more than it earned, and the Government did not mind the loss because telegraph was regarded as a public utility. The passage from the 'red' to the 'blue' came for the first time in 1877-78, the receipts exceeded expenditure. The net surplus was Rs 1,82,128.

LICENSED LINES

The licensed system of Indian Telegraph Department was introduced in order to provide greater amenities to the public. The Public Works Department Resolution dated 2nd May 1882 reads: 'The Governor-General in

* Inclusive of expenditure for construction of telegraph lines.
† Includes value of news free messages.
‡ Exclusive of expenditure by Public Works and other departments.

Council is desirous in the interests of the senders of the telegram, that Railways should be encouraged to carry public telegraphic messages to as great an extent as is compatible with the proper use of their telegraphs for the primary purpose of Railway Traffic'.

To simplify account-keeping, and to ensure uniformity of procedure, it was decided to extend to the Canal authorities also the privileges of carrying telegraph messages for the general public. Every railway or canal, or other licensed telegraph office, at which a message was filed, was to retain the value of the message it sent, excepting the amounts deposited for reply paid, or for post registered messages. And only one public telegraph message system throughout India, applicable to railway, canal, or any other licensed telegraphic system, was to prevail.

The effect of this concession to railways was 'a diminution in the cash receipts of the Telegraph Department'. In exchange for 'giving up its fair share of receipts in order to encourage licensed systems to carry public telegraph messages,' the Government began to pay to the Telegraph Department the whole cost of the Check Office, which was really the Telegraph Clearing House for the whole of India. The Government bore the whole cost of publishing and distributing the tariffs and regulations for the public. The Government share of the value of transferred messages that would have accrued to it had it not been for this concession, was Rs 116,515.

T BECOMES P AND T

The process by which telegraphy became an administrative annexe of the postal department is known as the 'combined office system,' and it was introduced in 1883. The railway-slow and the sound-fast systems of communication began to be housed under the same roof; separate windows began to make all the difference between a day and a minute. One of the reasons for this administrative amalgamations, as recalled by an old timer, was the 'superiority complex of the civilians'. I.C.S. officers headed the postal department, while 'mere engineers' were in charge of the telegraphs. 'What is a telegraph line?' asked a Member of the Viceroy's Council disdainfully 'It is only an elevated fence,' he pronounced his own answer.

The principal object of the scheme whereby the Post Office assisted in the operations of the Telegraph Office was to utilise a less costly method to open offices at many small places where the traffic was not sufficient to justify

a separate Telegraph Office. Before the scheme was introduced, it was found that Branch Offices in large towns could be managed by a comparatively inferior class of signallers if connected to Head Office to which reference could be made in cases of doubt, difficulty or emergency.

As a means of carrying out the scheme, the two departments made each other mutual concessions, which briefly stated, were:

(1) reciprocal free transmission of letters and telegrams on the service of the Telegraph and Postal Departments,

(2) payment by the Telegraph Department of all additional expense incurred by the Postal Department in undertaking telegraph work, and by the Postal Department of expenses incurred by the Telegraph Department in those cases when it undertook postal work, and

(3) the cost of training Postal employees for telegraph work, including the pay of their substitutes while under instruction, and their travelling allowance to be borne entirely by the Telegraph Department.

At the end of 1884-85 and as a consequence of the combined office system, there were 267 offices worked by the Post Office for the Telegraph Department against 55 at the end of the previous year. To connect these offices to the main system of the country, 1,216 miles of new line and wire, and 636 miles of new wire on existing supports had been added between the inception of the scheme in December 1883 and 31st March 1885.

The following is a comparative table showing the number of offices and the mileage of line connecting Post Offices with the main telegraph system at the end of 1884-85 and 1883-84:—

Years	Number of Offices		Mileage of line and wire added to connect Post Offices with the Main system	
	Transferred to postal Agency	New	New wire on existing supports	New supports and wire
1884-85 . . .	73	194	636	1,216
1883-84 . . .	24	31	612	405
Additions during 1884-85 . .	49	163	24	811

Exclusive of the 2,300 village offices, there were about 5,000 Post Offices (not combined with Telegraph Offices) in India in 1884 at which messages were being received for transmission by Post to the nearest Telegraph Office by messengers. The number of telegrams tendered during the year at these offices was 25,650, and their value Rs 27,387.

The extra duties imposed on the Post Master at these receiving offices were not heavy, and he was remunerated for his trouble by a percentage on the Sale of the Stamps required for the payment of the messages he forwarded, the commission being paid by the Telegraph Department. Upto the 31st March 1885, 411 Postal employees had been trained and had been granted certificates of proficiency by the Telegraph Department.

WORDS OF THE WEATHERMAN

With a view to afford the Meteorological Department facilities for promptly warning the various ports of India and Burma of approaching bad weather, a special class of storm signal telegrams was introduced during 1887. These telegrams were given 'precedence' over ordinary and urgent messages, and frequent use of this facility was made by Meteorological Reporter to the Government of Bengal, and by the observers at certain important stations, where there was risk of delay in transmission of telegrams sent in the ordinary way. The service between the Meteorological Offices and the Central Telegraph Office in Calcutta was also improved to enable the Meteorological Reporter to disseminate his daily reports earlier than ever before. A considerable number of the Meteorological observers throughout India were employees of the Telegraph Department, and as the work of the two departments was so much interlocked, the combination worked well and economically.

CAME THE PHONOGRAMS!

Phonograms were introduced at Bombay and Calcutta during 1895-1896 whereby any telephone subscriber could, for a nominal charge, read out his telegram by phone to the Departmental Telegraph Office where it was booked and then transmitted to its destination in the usual way. This obviated the necessity of the subscriber going personally to the telegraph office to hand over the telegram. Mainly it saved bother to the subscriber's bearer or chaprasi. The number of such messages sent in the year was 34,458. An

interesting item during the Coronation Durbar was that the Viceroy's speech was telegraphed verbatim to the London press, the first ever to be telegraphed directly.

The Phonogram system was very popular and the number reached a new height by 1939-40; telegrams booked and delivered through the instrumentality of the telephone were 504,709 and 487,479 respectively.

AT THE TURN OF THE CENTURY

At the beginning of the 20th Century, the capital account of the Telegraph Department was Rs 6,76,64,079 and the expenditure on that head was Rs 25,51,449. The working expenses were Rs 67,16,372 and the revenue collected was Rs 1,03,65,897, giving a surplus of Rs 36,49,525. The Telegraph Department operated 52,909 miles of line, 170,766 miles of wire, and 283 miles of cable. Of the wire, 57,423 miles were used by railway, 2,650 by canals and 110,693 by the Telegraph Department, while of the cables, 13 miles were used by railways and the rest by the Department. The total number of Telegraph Offices were 4,949, including canal and railway offices. Inland telegrams to the value of Rs 83,08,283 were handled by the Department and the total number of paid messages booked came to 6,237,001. Foreign telegrams totalled 834,493 and brought in Rs 22,27,990, showing an increase of 10·73 per cent. over the previous year.

The progress made during the previous 50 years can be assessed from the telegraph statistics for the year 1851-52:

Miles of wire, including cable		82
Number of offices		6
Total value of Inland paid messages	Rs	6,000
Capital Expenditure	Rs	24,300
Receipts	Rs	6,000
Working Expenses	Rs	5,380

For communication between India and Europe, three routes were in vogue: (1) sea route *via* Suez, (2) Indo-European route *via* Tehran and (3) Indo-European route *via* Turkey. The Suez route was used most for contacts with Europe. Communication with South Africa, Mauritius, Madagascar, as well as with the Straits, Australia and China was maintained in the opposite direction. India formed the transit station for communication

between Western countries on the one hand and Australia, China and Japan on the other. Bombay was the entry station and Madras, the exit, using Madras-Penang cable.

The Indo-China line route *via* Burma was not up to the mark because of many prolonged interruptions and also due to the absence of proper maintenance. The number of messages exchanged between India and Ceylon on one hand and China on the other was only 320 during the year.

TELEPRINTERS TICK

We now come to the story of printing telegraphy made possible by the permutations and combinations of electric impulses of equal durations. The Baudot System was introduced in India in 1905-1906. The system worked between Calcutta and Rangoon with Akyab in 'translation,' and between Calcutta and Bombay with Agra in 'translation'. The maximum number of messages disposed of on a single wire in one day of 14½ working hours by this system between Calcutta and Agra was 1,637, giving an average speed of 112·8 messages per hour. The day was 2nd July 1907. The Murray System was introduced almost simultaneously, in November 1906, between Bombay and Calcutta. Three experts were imported from England to inaugurate the system and to train local staff. The scheme, however, was only a partial success.

Experiments carried out in speeding up the existing Telegraph system became successful. The Creed-Wheatstone automatic system was replaced by other Multiplex systems like Murray, Baudot (quad) and Morkrum. The Murray-key-board perforators and tape transmitters were installed at Bombay and Agra during 1923 and this system disposed off systematically and smoothly the heavy commercial traffic between the two stations. Quad-Baudot working was used between Bombay and Karachi and found admirable.

The Morkrum system worked between Bombay and Karachi. This system operated from a key-board at the transmitting end and gave a clearly printed tape in Roman Characters at the receiving end. Its working was not dependent upon the maintenance of continuous synchronism between the sending and the receiving apparatus. A speed of 45 words per minute could easily be obtained and the key-board was familiar to any ordinary

typist. The system gave fairly satisfactory account of itself even when a line was disturbed, thus proving its superiority over Baudot.

During 1929, teletype working was introduced between Calcutta Central Telegraph Office and Park Street Combined Office, and also between Old and New Delhi telegraph offices. This system worked well. After all, it was a one-city affair. The teleprinter system of working was next introduced between Delhi and Agra and between Calcutta and Patna. The results were found encouraging because it disposed off traffic more expeditiously.

To increase the revenue from Telegraphs, a surcharge of one and two annas was levied on ordinary and express telegrams respectively from the 18th October 1931. The surcharge, however, did not apply to telegrams sent to Ceylon, Lhasa (Tibet) and Burma. The fees for registration of abbreviated addresses was also enhanced. The former charges were Rs 15 yearly or Rs 7 As 8 half yearly and the charges were now increased to Rs 25 yearly or Rs 15 half yearly. Greeting telegram service which came into effect from 2nd June 1931 was extended to Britain at a special cheap rate on certain festive and congratulatory concessions. It became possible for men to be more social. A husband on a business trip could wish his wife 'many happy returns of the day' without giving a second thought to annas and pies.

A four channel telegraph carrier (High frequency), the first of its kind in India, was installed in 1932 for telegraph traffic between Bombay and Calcutta. The first message transmitted on Morse on carrier channel I, was on 23rd January 1932. On 26th November 1936 two teleprinters were installed to work on the carrier channel route. The High Frequency Telegraph system was gradually expanded to include:—

two systems between New Delhi and Bombay,
one system between Madras and Bombay,
one system between Karachi and Bombay.

Teleprinters were working successfully on these carrier systems by 1937.

As late as June 7, 1953, it was announced that a new teleprinter service which will enable subscribers to communicate with each other directly was being introduced in Bombay. 'The Telex' in Bombay will have an exchange for 20 subscribers. Ahmedabad will soon follow in Bombay's footsteps.

Under the system, popular in American hotels, each subscriber has a teleprinter. A dial enables one customer to contact another. The Telex

is better than the telephone in that the man at the receiving end need not be present when the message comes through. The Posts and Telegraphs is exploring the possibilities of manufacturing teleprinters in India.

PRESS AND TELEGRAPH

In the teleprinter is to be found the crown and culmination of the telegraph's relationship with the press. The Fourth Estate is inconceivable today without the promptitude and power that it is furnished with by the globe-circling wires. Written communication at fast and cheap rates enable newspapers to receive from their correspondents and from news services thousands of words daily to overflow their columns. The system of 'bearing authority' absolves the filer from the obligation of pre-payment, and the teleprinter is like a private telegraph system between the news editor and the news gatherer in a far off place. The advantages of the printing telegraphy have contributed greatly to the present estate of the Indian Press.

Before 1851, when the Indian telegraph came into existence, the Company Bahadur's ships took from '3 to 18 months to sail from India to London round the Cape'. Private letters and packages were charged exorbitant rates; every private letter or package which weighed more than two ounces was 'taxed with the payment of four sicca rupees; every one exceeding three ounces, nine sicca rupees', and so on.

A 'sicca rupee' meant two shillings in those days, so one can imagine the cost. The establishment of the Indian telegraph provided the newspapers with its most essential sinew—the rapidity of communication. Telegraph brought to the city desk 'today's news today,' even when such news came from London or New York or Moscow. The whole newspaper industry was revolutionised.

Full coverage at a cheap rate was what the newspapers of the country received from the Indian telegraph. Here is the Indian Telegraph's finest attribute. Although considered a 'commercial,' it operates like a welfare State where the Fourth Estate is concerned. It charges less than what it spends on transmitting a press despatch. Unremunerative, specially cheap rates for the press are among the prominent causes of the Department's occasional deficits. In connection with the press, the Indian Telegraph operates as a Government-subsidised service. In 1931, when a special surcharge was added to telegraph tariff in order to raise revenue, the press was

left untouched. They could maintain their own special correspondents in various cities of India as well as abroad, and to some extent they could dispense with absolute reliance on news services, thus increasing their distinctive character. And full coverage meant more pages which in turn meant greater revenues from advertisements. When finally teleprinters became fashionable, even private business firms began to have their own ticker tapes in their offices.

In the closing years of the nineteenth century, unfortunately the Indian telegraph was utilised by the British Raj as an added avenue of censorship. The East India Company, and later the Crown, were engaged then in extending and consolidating their sway, and the main news in those days pertained to military operations. Naturally for the Government and to the understandable chagrin of the Press, the necessity for strict censorship was keenly felt. Apart from other legal instrumentalities, the telegraph service provided the Government with a 'third eye' which kept track of everything that was passing between correspondents and their editors.

The British authorities were often obliged to deport Englishmen serving British-owned newspapers, but they were even more suspicious of what was then described as the 'Vernacular Press,' and what is now known as the 'Indian Languages Press'. A subtle form of discrimination always existed, and it was codified in 1878 in the form of the Vernacular Press Act. *Amrita Bazar Patrika,* now one of the leading nationalist newspapers of the country, felt even at that time that the Vernacular Press Act was especially directed against itself. The owners and editors of that paper were 'equal to the occasion'. Overnight they changed *Amrita Bazar Patrika* from a bilingual to a purely English daily and on the morning on which the Vernacular Press Act went into effect, it was beyond its grabbing tentacles. The Vernacular Press Act, however, was repealed in 1882 because it invoked extreme resentment in India and widespread criticism in the British Parliament.

From 1830 to the day the Indian telegraph was thrown open for public use in 1855, the mercantile community of Calcutta had contributed towards the costs of running the system of 'semaphoric communication' which had been erected by the Government for the service of the capital. The Calcutta Press, therefore, enjoyed some advantages of quick transmission of news even before what is now known as electric telegraph came into existence. Here is a description of the system:

'The mode of working them (semaphoric towers) was by signals, such as those used on the railway lines, but much more clumsy. In foggy weather the semaphores were useless, as the signals could not be perceived; at nights also, the happy signallers of those days were permitted to enjoy their night's slumbers undisturbed, as the signals were not illuminated and hence could not be seen. This system of telegraphy continued in operation till the introduction of the present electric telegraph.' Thus the actual beginning of the modern daily press in India had to await telegraph's advent in 1855.

Elsewhere we have alluded to the strategic role played by the Indian telegraph during the 'Sepoy Mutiny'. Right here we are interested in the press evaluation of the part played by the Indian telegraph during the Mutiny. Wrote the Mutiny-covering correspondent of the *Times*:

> ' Never since its discovery has the electric telegraph played so important and daring a role as it now does in India. Without it the Commander-in-Chief would lose the effect of half his force. It has served him better than his right arm. By it he is enabled to direct the march of his battalions, the movements of his artillery and cavalry, to receive news of their successes, to survey, as it were, at any one time the whole position of his army and of its auxiliaries, to communicate with the Governor-General and with his subordinate generals, to sift the truth from the falsehood of native information, to learn what posts are likely to be threatened, where the enemy are in force, to spare his staff and his messengers, and yet to send messages with clearness and despatch. So much for its importance. As to the daring action of the telegraph, which includes of course those who direct it, I need only observe that in this war, for the first time, a telegraph wire has been carried along under fire and through the midst of a hostile country. *Pari Passu*, from post to post it has moved on with our artillery, and scarcely has the Commander-in-Chief established his headquarters at any spot where he intended to stay for a few days when the post and the wire were established also. The telegraph was brought into communication with the Governor-General at Allahabad, with Outram at the Alam-bagh, with Calcutta,

Madras, Bombay and the most remote districts over which the system is distributed. At one time (telegraph) men are chased for miles by the enemy's cavalry—at another time they are attacked by the Sowars, and they and the wires are cut to pieces—again, their electric batteries are smashed by the fire of a gun, or their cart knocked to pieces by a round shot ; but still they work on, creep over arid plains, across watercourses, span rivers and pierce jungles, till one after another the rude poles raise aloft their slender burden, and the quick needle vibrates with its silent tongue amid the thunder of the artillery. While Sir C. Campbell was at Cawnpore he could learn from Sir James Outram the results of an attack before the enemy had disappeared from the field. As he advanced towards Lucknow, the line was carried with or soon after him ; a tent was pitched near his, a hole was dug in the ground and filled with water, and down dropped the wire from the pole stuck up in haste, dived into the water otter-like, the simple magnet was arranged, the battery set in play, and at once the steel moved responsive to every touch. Owing to the extreme dryness of the atmosphere and the power of the sun, which at this season bakes the earth like a brick, the insulation of the current is nearly complete. The wire is thick, and is not protected by non-conductive coatings of any kind ; it is twisted round the top of a rude pole, fifteen or sixteen feet high, and, under ordinary states of the atmosphere, it is found to answer perfectly. We had not been very long in the Dilkusha ere we saw, in dim perspective, the line of posts advancing towards us, and soon the wire was slipped into one of the drawing-room windows, and now it is at full work, surrounded by all the shattered splendour of the palace, inquiring after the Ghoorkas, asking for more of something or other, exchanging ideas between Sir Colin and Lord Canning, or flurrying along a newspaper message to yourself, amid the whistle of the bullet, the roar of the round shot, and all the feverish scenes of war.'

The extension of the Indian telegraph lines was mainly inspired by military needs. To these were added the clamour of the mercantile community. The growing Indian Press was also one of the agencies which rooted for the extension of the telegraph lines so that it would quickly receive news from the four corners of the world. All these combined to provide a strong stimulus for the establishment of a telegraphic connection between India and Britain, and across the Atlantic. As a result, and as we have pointed out already, the first line between England and Bombay was completed on January 27, 1865. It was on the 1st January, 1872, that concessional reduced rates for press despatches were introduced in India. A further reduction in rates came in 1882.

When the art of printing telegraphy evolved into the machine known as the teleprinter, the relationship between the press and the telegraph reached a climax. Teleprinters began to be introduced in India around 1930, and from then on the Indian press has been provided with its main sinew by the Indian Telegraph.

LADIES SECOND!

Women in professions and Government jobs have been a revolutionary thing in India. Their entrance was long delayed, but once they were in, they were firmly entrenched. Employment of ladies in the Telegraph Department was initiated on 27th December, 1907. Their first assignment was as signallers on salaries of Rs 40, raising by annual increments of Rs 2 As 8 commencing from 4th year of service with a ceiling of Rs 80. Rangoon and Madras were exceptions; at Rangoon the scale was Rs 50—90, and at Madras Rs 30—70. Women probationers received an allowance of Rs 20 per month when under training. This policy has not been a great success as now there are practically no women telegraph signallers. The ladies however took to telephone operating very quickly and it has now been recognised that they make the best operators.

FOREIGN TRAFFIC

During the decade, 1910-11 to 1920-21, there had been marked variations in foreign telegraph traffic. The total number of telegrams increased from 1,417,094 to 2,756,264 and the revenue from Rs 25,01,601 to Rs 57,67,456. There were changes in the foreign telegraph tariff. Deferred foreign tele-

grams at half the rates began to be accepted from the 1st January 1911. From 1st September, 1912, telegrams between India and Ceylon began to cost, instead of 3 annas a word, one rupee for twelve words, with two annas for each additional word.

The reduction in the rate of private telegrams between India and the United Kingdom, from Re 1 As 8 to Re 1 As 4 a word, started from 1st May 1914. The all round reduction included private telegrams between India and Mesopotamia and Persia and the Persian Gulf.

Telegraphic money order service between India and Mesopotamia and the Persian Gulf started from the 1st September 1916 on rates equal to private telegrams. Money orders between India and the United Kingdom started on the same basis from 1st November, 1917.

The introduction of an 'Express' class of telegram between India and Ceylon on 1st February, 1919, at the rate of two rupees for twelve words with three annas for each additional word, opened up new vistas.

During September 1927 week-end letter telegrams were introduced between India and Burma on one side and Great Britain and Northern Ireland on the other, at three annas per word on the Inland route and 2½ annas per word *via* the Beam Services subject to a minimum charge for 20 words per telegram. The service was also extended to the Irish Free State, at a uniform rate of three annas per word for all the routes.

NATIONAL CASH REGISTERS

The first National Cash Registers in India were installed in August 1921 in the Calcutta Central Telegraph Office. These machines printed the class of message, its value and its serial number and date, both on the telegram and receipt. Wherever these Registers were used, no stamps were affixed to the telegrams, but the payment was made in cash, thereby expediting the booking of messages. Loss and theft of stamps were eliminated.

WINGED WORDS

About this time an arrangement was made to transmit telegrams by Air Mail to Western countries from Karachi. This Air Mail service for telegrams started on 28th March 1929. Arrangements were made during this year for the acceptance of Inland telegrams for transmission by telegraph up to Karachi and thence by Air Mail to Iraq, Palestine, Egypt and Great Britain.

The rate charged for these telegrams was the usual Indian inland rate according to the class of telegrams plus the Air Mail fees, in addition to the usual letter postage.

De Luxe telegrams were introduced from the 15th of March 1937 between India and Great Britain, South Africa, Kenya, Uganda, Australia, Hongkong and other foreign countries and cities. These telegrams were delivered on artistic forms and in attractive envelopes. The service was limited to messages relating to happy events or greetings. A supplementary fee of four annas was charged for each of these telegrams in addition to the usual fee, as a price for the embellishment.

On the Telegraph Traffic side the most important event during 1938 was the introduction of uniform telegraph rate between the countries of 'the Empire'. This was the result of a Conference of Heads of Postal Administrations of the Empire which was held in London during December, 1937 and which was attended by Shri G. V. Bewoor, the second Indian Director General of Posts and Telegraphs. This year also saw the introduction of De Luxe Inland telegrams from 1st June, 1938.

The Empire Social Telegrams of a non-commercial character, relating solely to greeting, family news or personal affairs, were introduced from the 4th December, 1939, and were made available between India and all Empire countries at a flat rate of Rs 3 As 6 for 13 words or less and $4\frac{1}{2}$ annas for each additional word.

WAR TIME SCHEMES

The Telecommunications Development Scheme in which the Railway Telecommunication Improvement Scheme was included, started in the beginning of 1943 as a war-time requirement. These Schemes were wound up formally on 31st March 1947. After the cessation of hostilities the Defence Department modified a number of their telecommunication requirements under the Telecommunications Development Scheme and consequently a considerable quantity of apparatus and other plant originally ear-marked for the scheme was diverted to meet the Posts and Telegraphs requirements and needs. The basic plan, which had been previously approved by the Telecommunication Development Board, envisaging the All India-network to be provided under that scheme for main line carrier telephone, V.F.T. and other systems, was revised to suit the post-war needs of the Department. Adjustments regarding

the value of assets were made between Defence and Posts and Telegraphs and the Telecommunications Development Board decided to purchase the main network portion of the Defence Department at a total cost of Rs 4 crores for use in post-war development networks.

OPERATION PUSH BUTTON

The Scindia Steam Navigation Company, Bombay, approached Posts and Telegraphs to make arrangements required for launching *S. S. Jalaprabha,* the second ship built in their dockyards. The Posts and Telegraphs provided one speech channel between New Delhi and Vizagapatam including terminal cable pairs between New Delhi and Irwin Stadium and between Vizagapatam Carrier Station on the Harbour. A similar channel was provided for ringing arrangement so that when the push button was pressed by the late Sardar Patel it would operate the relay at Vizagapatam. To the contacts of this relay were connected a local circuit by the Scindia by operating a solenoid to release the ship. Alternative arrangements by wireless were also made by the All India Radio. The system was tried about four days ahead in collaboration with the All-India Radio. The arrangement entailed working in co-ordination of all the offices in Delhi, Calcutta, Vizagapatam on one side and Delhi-Bombay, Madras-Vizagapatam on the other side. The arrangements worked very smoothly on 20th November, 1948 and the ship was launched at 09·46 hours on 20th November by the late Sardar Patel who said, 'I have pleasure in naming Scindia Company's 8,000 tonner completed at Vizagapatam,*Jalaprabha,* and launching by wireless from New Delhi. May good fortune and prosperity be with her and all those who are connected with her'.

Another similar instance. The Posts and Telegraphs gave the circuits between Bombay and Vizagapatam and made it ready for the launching of the 8,000 tonner *S. S. Jalapushpa* at 09·92 hours on Saturday, the 15th December, 1951 by pressing an electric button at Sunderbai Hall in Bombay. This arrangement was made at the request from the Scindia Steam Navigation Company. The Bombay Telephone District provided five pairs of wires forming the local ends for one transmission circuit, one receiver circuit, one pair switch between Bombay and Vizagapatam, one control board to be fitted with telephones at both ends and one pair as standby. Chicago Radio Telephone Company provided equipment for the transmission and receiving

programme between Bombay and Vizagapatam with the modulators in Bombay and also provided the necessary switch for the launching of the ship at the Bombay end. The distance of nearly 1,000 miles was thus telescoped by the equipment of the Posts and Telegraphs.

THE WIRE-PULLERS

To avoid the malicious breaking of telegraph insulators and common theft of copper wire, police action was taken expeditiously in Burma and offenders brought to book. Copper-weld wires were tried experimentally, wherever necessary. Stealing of wire, specially copper wire, is a common failing in India. Thousands of yards are cut each year and sold in Chor-bazar (thief market). But a law making it punishable even to sell copper wire of gauges generally used by Posts and Telegraphs was to come as late as 1951. Still the practice flourishes.

V. Indianisation of Inventions

'LIFE IS AN OFFENSIVE,' wrote philosopher Whitehead, 'against the repetitive mechanism of the universe.' In this struggle nothing has helped men as much as scientific inventions which progressively made him more and more independent and master of nature. The repetitive mechanism of nature is most fierce in countries like India subject to tremendous storms and floods and earthquakes. Sensitive things like electric current and telegraph wire, experience the wrath of elements more poignantly than man himself. The story of the laboratories maintained by the Posts and Telegraphs is a narrative of efforts at keeping remote corners of India in contact with each other irrespective of wind, sand and rain.

Scientific inventions and the manufacture of delicate tools are among the glories of man. Perhaps India cannot share that glory on equal footing with Western nations and with Japan because political subjugation robbed talented young men of much-needed opportunities. But the nation has a right to bask in the reflected glory because a great deal of adaptiveness, imagination and technical daring have gone into conditioning, 'Indianising', foreign inventions to meet the country's unique needs. The Indian chapter in the history of tele-communication cannot cover claims to primary originality which includes epoch-making discoveries, but it can certainly lay claim to secondary ingenuity which turns the products of highly advanced communities into serviceable tools for a country technologically backward. And in certain respects, as in the case of the tongue-tester, India's inventive record indeed commanded the attention of foreigners. Posts and Telegraphs' endeavours in technical field began as early as the first extension of the line from Calcutta to Agra. And Indian inventors and technicians and administrators got into their stride as they began to come in

contact with their opposite numbers in advanced countries at international conferences.

The Telegraph Department progressed perceptibly in technical matters even in early stages. The knowledge of the testing of instruments, stores, and working lines had been greatly extended among the higher grades as well as in the Signalling Branch, every facility being provided to those who showed a desire to perfect themselves in this useful study. The Department had started to publish text books and guides.

THE TONGUE IS THE TESTER

The first part of the pamphlet on Testing Instructions was compiled by Mr Schwendler with so much care and ability that the book, when completed in 1872, was considered 'superior to anything of the kind then published in the world'. Although it was designed to be easily intelligible to all grades of the Department, 'it thoroughly elucidated the theory of the subject for the benefit of the more advanced.'

The Electrical Superintendent had fashioned a device of detecting insulators on telegraph lines which had become defective, or which were imperfect when originally supplied. This was before the introduction of the practice of testing materials of all kinds prior to issue. The apparatus for testing the efficiency of insulators was based on the principle of sending a 'magneto-electric' current through the resistance of the insulator, and measuring the strength of such current by its effect on the tester's sense of feeling or taste. Here was a peculiarly Indian way, based on taste and feeling, different from that used in other countries. The human tongue supplemented the mechanical measuring rod.

An insulator offering a resistance of less than 1 megohm (1 Megohm= 1,000,000 British Association units) could readily be detected by the shock experienced by the tester while holding the contact point in his hand. In the event of no such shock being felt, the tester touched the contact point with his tongue, and if the insulator had a resistance less than 8 megohms, a strong metallic taste would be experienced. Should no such taste be observable, the insulator was passed as serviceable. In this way, all insulators under 8 megohms resistance were eliminated from the working lines. Although 8 megohms might be considered a very low standard, it was found

in practice that perfect insulators ranged very far above this limit, while very few defective insulators passed this limit.

The value of the Indian Tester had already been perceived by more than one European telegraphic administration, and arrangements were completed for their manufacture in London. Those in use in India were made in India at the Departmental Workshops. Steel of the best quality was required for the manufacture of the magnets of the apparatus and this had to be obtained from England.

By means of a simple formula experimentally arrived at, the efficiency of the telegraphic instruments in use in the Department at that time could also be readily tested. It was found that the relay of any instrument when in perfect order should function with 10 battery elements through no resistance, and with 1 element through an external resistance equal to that of the relay itself, without any alteration or the adjustment being necessary. The first test represents the strongest, and the second the most feeble current of electricity likely to reach the instrument in practice, and the combined tests define the range through which it is capable of working without the necessity for readjustment on the occurrence of transitory variation of the insulation of the line.

Times have changed and the human tongue has now been replaced by elaborate testing equipment in the laboratories. But the same spirit is there, the constant effort to keep the communication lines open in this vast sub-continent. When we think of the crude tools that the telegraph Engineers of those days had and when we read of their achievement in spite of these limitations we are filled with admiration.

STUDY OF A STORM

Indian poetry from Vedic hymns to Rabindranath Tagore abounds in the 'storm theme'. Unusual atmospheric disturbances, manifested by high winds and rain and lightning, have provided the subject matter for poems and paintings. This is because storms are very frequent in India and they are of shattering magnitude.

A storm could never be as welcome to a telegraph operator as it would be to a poet; in the case of the former, it is a challenge. Floods, avalanches, cyclone devastations, are taken in their stride by the men of the Telegraphs. Lines are blown down and they have to be restored at

any cost, cables get damaged and work has to go on round the clock to repair them. There is however another kind of storm, the magnetic storm about which the poets may not find anything to be lyrical about, but which plays the devil with telecommunication circuits due to its insidious nature. The first challenge of major proportion to the infant telegraph line in India came in 1872. Wires running east and west in South India began to vibrate with the intensity of a magnetic storm on 15th October, 1872. One W. P. Johnston, an Assistant Superintendent in charge of the Madras Telegraph Office, did not take it lying down. Sitting in his office he began to record a series of observations that were destined to save the Indian Telegraph Department lakhs of rupees in subsequent years.

Although the wires between Madras and Bombay, between Bezwada and Hyderabad were effected, the lines between Madras and Bellary exhibited a specially intense agitation throughout the day. The direction as well as the intensity of the disorder was changing with great rapidity. The maximum positive current flowing towards Madras was noted as equivalent of fifteen battery element while in the opposite direction an electromotive force equal to 22 elements was registered by the tests taken.

At six in the morning the natural current became so strong as to disturb the working of the wires. By 11 A.M. work on the four Bombay-Madras wires came to a halt. The peak was reached at 1 P.M. After that there was a decline in the effects of the magnetic disturbances which stopped completely by 6-15 P.M. Because the storm was travelling in an easterly direction, the cessation of the natural current did not occur till 9 P.M. at Bezwada. In the natural course, the observatory authorities were alerted by the Madras office soon after 6 A.M., but the Magnetometers at the Bezwada end did not register any disturbance until about noon. When the storm was at the height at Madras, the wires leading into that city from the west had, for some hours, been showing diminishing effects of magnetic disturbance.

Schwendler, the Electrical Superintendent who had by this time taken to writing text books and instruction guides for the Department's staff, made a detailed study of the data gathered and drew up a list of instructions. From then on the inconveniences caused by magnetic storms were reduced to a minimum. A new device was instituted; the idea was the substitution of a return wire for the usual method of leading the current to the earth.

The Magnetic storm rode again after full 50 years. On 12th May, 1921, it began with moderate intensity at 11 hours. It increased in intensity at 18 hours, and lasted till 17th May, shaking so seriously all Telegraph lines as to produce a very heavy accumulation of traffic. It was one of the severest storms in 50 years. Fearing it is a cyclical phenomenon endemic to India, the Posts and Telegraphs is getting ready for 1971.

COPPER WIRE

The use of copper wire for overhead lines instead of iron wire was introduced successfully between Bombay and Madras during 1886-87. Its disadvantages were the need of very careful handling in its erection and its high rate of expansion and contraction under changes of temperature; but the former could be overcome by the employment of properly trained workmen and the latter could be disregarded in consideration of its immense electrical superiority. The high conductivity of copper as compared to iron was well-known, and when hard drawn and pure, it was found to possess great mechanical strength, and to be practically free from the electro-magnetic inertia which in iron wires so seriously retarted the transmission of electricity. In India, where the distances are so enormous, this quality was doubly attractive.

The Department Report for 1886-87, adds: 'The trial of hard drawn copper wire, having proved encouraging, a wire of this metal was put up between Bombay and Madras, 800 miles, and between Bombay and Nagpur, 520 miles. It is in contemplation to extend this latter, by wire of a similar metal to Calcutta, as soon as the line of posts along the Bengal-Nagpur Railway is completed. The results obtained on the new wire are highly satisfactory. Bombay and Madras are now able to work quadruplex without any intermediate translating station.' Since those days copper wire has been used in increasing proportion.

THE TECHNICAL 'BRANCH'

Technical progress continued apace. Dry batteries were used for the first time in 1891-92 to test their suitability under the varying and taxing Indian conditions. The experiments were successful, as dry batteries scarcely required any maintenance.

A series of highly important experiments was undertaken by Mr J. J. Allen, then Electrician, with a view to determining precisely to what extent Wheatstone's automatic apparatus could be used on the longer circuits which were so common in India. In this apparatus, instead of signalling directly, a tape was punched which was fed into a transmitter which sent the signals on the line. This equipment could raise the speed of the transmission considerably. After much care and skill had been expended in getting the instruments into working order (they had been lying unused at Karachi since November 1890), and after various trials, messages of 1,000 words were transmitted between Calcutta and Nagpur, 770 miles of copper wire, in less than 4 minutes, and between Calcutta and Bombay *via* Nagpur, 1,295 miles of copper wire, in 5 minutes 10 seconds. The experiments concluded with the transmission of messages between Bombay and Allahabad, 850 miles, 279 miles of copper wire and 571 miles of iron wire, for several days at a rate of 120 words a minute.

Another experiment which was made at Calcutta and Bombay during this time pertained to typewriting telegrams direct from the sounder; the system was successful already in America. After exhaustive trials the Department was forced to abandon the experiments, not because they were not successful but the typewriters proved much too noisy and rendered the system unsuitable to Indian Telegraph Offices, where sounders were used exclusively. With the improvement in the design of typewriters making them 'noiseless', they are now being used to a limited extent for typewriting direct from the sounder.

An interesting technical achievement during 1908 was the working of the Wheatstone system between Calcutta, Madras, and Rangoon on the one end, with London on the other, *via* Karachi, a distance of 8,700 miles on an average. The speed of working was 35 words per minute.

A technical Branch as a separate organisation for giving general expert advice on all matters pertaining to the Telegraph Department was inaugurated on 1st April 1910. The head of the Branch was called the Electrical Engineer-in-Chief, and he had a staff 29 members strong. The post of the Electrical Engineer-in-Chief was abolished after World War II, when his duties were taken over by the Additional Chief Engineer, who is now the technical adviser to the Posts and Telegraphs.

THE HINDI TELEPRINTER

Feelings in favour of the national language, Hindi, began to be codified in law in independent India. One important segment of implementation of the Constituent Assembly's decision fell upon Posts and Telegraphs. The transmission of telegrams in Hindi, written in Devanagari script, was introduced in June 1949. Experiments on teleprinter key boards to accommodate all the letters of Hindi script were undertaken by the Department itself.

The problem of evolving a suitable Hindi Teleprinter was tackled by the Department as early as 1949. The existing teleprinters in the Department are of five-unit code, which restricts the keyboard to a maximum of 31 keys and the total number of characters printed to 54, and one of the supreme difficulties in evolving a Hindi teleprinter is the limitation imposed by the keyboard; the stage is too small for so many players (47 Devanagari letters, plus 11 Matras, plus Conjoint Sounds as against only 26 letters in English Script) to play. However, the Teletype of America have evolved a six-unit teleprinter which allows transmission of more than 100 characters and so is ideally suited for transmission of the Devanagari alphabet.

The first task of the Department has been to modify existing English language teleprinters. These teleprinters were mostly manufactured by the Creed & Co., of England, Siemens and Halske of Germany and Olivetti of Italy. The modifications required consisted of (i) introduction of dead keys transmitting Matras and certain signs; (ii) fixing the Hindi types in the same space occupied by the present English types.

The printing of Devanagari script requires addition of certain Matras (approximating vowels) to letters. When the keys containing the Matras are operated, it is necessary that the carriage should not move and this requires special innovation in the teleprinter keys. Such features exist in the present teleprinters for special keys, such as 'Figure and Letter' Shifts, etc., and it is only the extension of similar features for other keys containing Matras. As the number of characters that can be accommodated on the five-unit type of teleprinter is limited, the following modifications of the script have been made;

(1) the *Swara-Khadi* system has been adopted for the vowels,
(2) for conjunct consonants the *Halant* system has been adopted,
(3) certain infrequently used letters have been dropped.

Dead keys had to be provided to accommodate all the Matras including *halant*. Hindi typing is being done in two ways in the case of Hindi typewriters. In the first method, the matras are typed first and the letters afterwards, and in the other method, the letter is typed first and carriage moves; the key containing Matras is then typed and the type-bar containing the Matras has an off-set arrangement so that printing takes place over the letter already typed. The second method has been preferred in evolving the Hindi Teleprinter.

The fixing of Hindi types on the English teleprinter type wheel was difficult due to the limited space. English letters do not have any Matras, and to accommodate Devanagari letters with all the Matras, on tops and bottoms of characters in the same space, resulted in making the type too small. Even the slightest smudging of the ribbon produced illegibility; this difficulty could only be overcome by developing Hindi teleprinters either around a large type of machines similar to Creed or by using type-bar machines only, such as, the Olivetti and Teletype which allow larger type to be fixed easily.

The first keyboard evolved by the Department for accommodating the 56 characters was done on a very rough basis and this was demonstrated at the annual session of the Indian National Congress held in 1951 in New Delhi. Many further modifications have been made since then in the mechanism as well as in type-heads and the letters have been rearranged on the basis of frequencies with a view to increase the speed of the operator. Two modified teleprinters were actually put in use during the last session of the Indian National Congress held at Nanalnagar in January 1953 and about 400 messages were transmitted on these machines to New Delhi.

The speed of operation of the Hindi teleprinter at present is not high enough due to the fact that the 54 characters representing a further modification of the script have to be accommodated in both the shifts and while transmitting, it becomes necessary to move from one shift to another frequently, resulting in loss of speed. All teleprinters with 5 unit code will impose this restriction and hence the Department continued negotiations with various manufacturers for making further experiments in improving the Hindi teleprinter.

One of the foreign companies has now come forward with a better type of keyboard with storage facilities or automatic shift arrangement. This

keyboard has as many keys as there are characters, unlike the normal teleprinter which the Department had developed wherein two letters are shown on one key. The storage type keyboard gives the facility of transmitting characters appearing on any shift by making arrangement to send automatically the 'figures' or 'letter' shift whenever necessary. This allows in actual practice higher operating speed and is certainly an important development in Hindi teleprinters. However, the number of keys per row will be 14 and considerable amount of work has to be undertaken to rearrange the letters and signs according to their frequencies. The switch type of keyboard certainly gives the maximum facility for the Hindi teleprinter within the limitations of 5 unit machines. It has the earmark of becoming the standard Hindi teleprinter machine, although the limitation imposed by the 54 keys is certainly a very severe one; public reactions are still awaited.

The main advantage in the six-unit code is that it can give 63 combinations on each shift. This makes it possible to accommodate all the letters and signs of the Devanagari script without any mutilation or modification being necessary. Alternately, the most important characters in the modified script can be accommodated in the letter shift, putting less important ones in the figure shift. This will certainly lead to greater ease and speed in operation. The slight reduction in the transmission speed of letters due to six-units is compensated by the ease of sending. An added advantage of this teleprinter is the facility to provide a keyboard identical with that of Hindi typewriters with 88 characters as already standardised. The Department is now obtaining three of these machines for suitably modifying for Hindi working. Trials are still to come.

INTERNATIONAL CONFERENCES

Confucious's China believed in government by music. An Indian wiseacre has asserted that democracy is a government by public meetings and a world order, the outcome of international conferences, seminars and roundtables. When India entered the global scene, it was first represented by Englishmen, and although they looked after the British interests, they did not let down India. But with the Indianisation of services and with the rise of the freedom struggle in the country there came a change. Indian officials first began to be sent abroad to play a second fiddle to the British leader of

the Indian delegation. In the end, however, delegations were completely controlled by Indian officials.

The ordinary quinquennial International Telegraph Conference at Berlin took place between 10th August and 17th September, 1885 and India was represented by Colonel Sir T. Bateman-Champain, Director-in-Chief of Indo-Europeans Telegraph Department, assisted by Mr. C. H. Reynolds, a Superintendent of the Department.

An International Electrical Congress was held in St. Louis, Mo., United States of America, in connection with the Louisiana Purchase Exposition in September 1904, to which all Governments were invited to send delegates. Mr. J. C. Shields, Assistant Superintendent of Telegraphs, was selected to represent India. As one of the principal results of the Congress, endeavours were made to secure international agreement in the nomenclature and determination of electrical units and standards.

During 1908 the quinquennial International Telegraph Conference of various Administrations and cable companies who subscribed to the International Telegraph Convention took place at Lisbon. The Indian delegates were Mr. H. A. Kirk and Mr. F. E. Dempster, Englishmen, naturally.

Enters the first Indian. Messrs H. A. Sams and P. N. Mitra represented India at the Brussels Conference held in September 1928. The event is worthy of note. It was for the first time that an Indian was chosen to represent his country at an International Conference. This Conference dealt with the question of Code telegrams, and its decisions went into force from 1st October, 1929.

The Madrid International Telegraph Conference met from September to December, 1932, and Messrs M. L. Pasricha, Postmaster-General, and P. J. Edmunds, Director of Wireless, represented India. Mr. Pasricha was the second Indian to attain such high status since the British began to discard their post-Mutiny distrust of Indians and began to recruit the sons of the soil from 1895.

There were changes in Foreign Telegraph service according to the International Telegraph Regulations as a result of the Conference held in Paris in 1949.

VI. The Grand Century

THAT IS THE STORY of the grand century. Whether we take as the base the year 1839 when O'Shaughnessy started his experimental line from Calcutta, or the year 1851 when the first telegraph line was opened for official traffic, or the year 1853 which marked the end of experiments and beginning of large-scale construction, or the year 1855 when the system was thrown open to the public, it has been a saga of steady progress against peculiarly Indian odds of erstwhile colonialism, technological backwardness, financial stringency and natural elements at their nakedest worst. The earliest map of telegraph network available in the original form pertains to 1856, the eve of the Sepoy Mutiny. It shows 4,250 miles of electric telegraph line in India. We have still three years to go to complete the century which began in 1856, but even in 1953 we had 777,566 miles of iron, copper and bronze wire, 789,870 miles of cable conductor and 244,931 miles of carrier channels.

DATELINE 1953—

In March 1953, the Telegraph Department had :

Post Lines Telegraph Lines	89,304	miles.
Wires of Telegraph Lines	627,189	miles.
Telegraph Cables	731	miles.
VFT and HFT channel mileage	244,815	miles.
No. of faults per 100 miles of line		32·15
No. of faults per 100 miles of wire		4·57
Total No. of telegraph offices		8,463
Total No. of Inland and Foreign telegrams :		
Press		251,814
Ordinary		28,910,608
Total revenue	Rs	5,43,68,610

Expenditure incurred in 1952-53 —

	Lakhs
Telegraph Buildings	16
Telegraph lines and wires (excluding those required for telephone works)	54
Telegraph Lines and Wires for telephone works	82
Telegraph A. & P.	6
Telegraph L. and W. erected during the year 1951-52—	
(*a*) *Post lines*—	
Telegraph lines	2177 miles.
(*b*) *Overhead copper, bronze and iron wire*—	
(*i*) Telegraph wires used for Departmental Telegraph Offices	389 miles.
(*ii*) Telegraph wires rented to canals, Railways, etc.	1397 miles.
(*c*) *Cables*—	
Telegraph cables for Departmental Telegraph circuits	46 miles.
(*d*) *Copper conductor in cables*—	
Telegraph cables used for D. T. Os.	282 miles.
(*i*) Telegraph offices opened	Nil.
(*ii*) Combined offices opened	147

THE SUPERLATIVES

Here are some of the '*superlatives*' :

The Indian Telegraph Department is one of the largest in the world in open wire carrier equipments.

The Indian Telegraph is the oldest government-owned public utility in the world.

The Indian Post and Telegraph is the second largest nationalised public utility in India, employing around 219,710 men and 991 gazetted officers.

The Indian Telegraph has the third longest telegraph channel mileage in the world.

The Indian Telegraph has the sixth largest inland traffic in the world, next only to United States, Japan, United Kingdom, Australia, and Italy. But in number of operations, it is second only to the United States.

The Indian Telegraph maintains the highest telegraph office in the world, at Bhutong, 13,500 feet above the sea level, built as early as 1887 in connection with the 'Sikkim Expedition'.

The Indian Telegraph maintains the highest line in the world, at Khambajon, in Sikkim, 17,500 feet above the sea level.

The Indian Telegraph has the longest over-river span in the world, 4,500 feet, just south of Vijayawada, the hillocks on either side of the Krishna River forming convenient palisade poles. For crossing the Back-Waters at Cochin, 14 wooden posts were planted in the mud under the water, 85′ to 110′ tall.

The Indian Telegraph was ahead of Great Britain by five years when it started the Telegraph Money Order in 1884.

The Indian Telegraph's original radio circuit between Diamond Harbour and Port Blair in the Andamans was the first wireless service in the world to be opened for paid public traffic. It was in October 1904.

Here are tables that tell in figures part of which has been told in words:—

INLAND TRAFFIC : 1950-51

United States	175,077,035
Japan	85,787,672
United Kingdom	41,614,000
Australia	35,485,676
Italy	28,543,742
India	23,227,078

LINES, WIRES, ETC. : 1952-53

	Iron, Copper and Bronze wire	Cable Conductor	Channels
Mileage of Telegraph wire .	627,189	20,493	261,363
Mileage of Telephone wire .	150,377	769,377	171,119
Number of Telephone Exchanges on 31st March 1953 (including PX's and PBX's) ..		4,594	

	Iron, Copper and Bronze wire	Cable Conductor	Channels
Number of Telegraph Offices including Railway and Canal Offices on 31st March 1953		8,463	
Number of Telegrams (Inland and Foreign)		29,162,422	
Total number of Trunk Calls ..		10·8 millions.	
Total number of Telephones on 31st March 1953		201,000	
Radio-Telegrams		575,000	
Total output of workshops . ..		Rs. 279 lakhs	
Total number of employees in the P. & T. Department ..		2,19,710	
Total number of Gazetted Officers in the P. & T. Department ..		991	

CAPITAL OUTLAY, REVENUE 1952-53

	Telegraphs	Telephones	Radios
Capital outlay during the year (R.E.). .	Rs 91,88,700	Rs 3,86,17,100	Rs 13,65,500
Capital outlay to end of the year (R.E) . . .	Rs 30,00,28,906	Rs 30,08,27,146	Rs 53,30,739
Revenue (R.E.) . .	Rs 6,41,70,000	Rs 10,34,28,000	Rs 8,62,000
Expenditure (R.E.) . .	Rs 5,90,95,000	Rs 7,05,99,000	Rs 24,70,000
Profit (+) or Loss(—)(R.E.)	Rs(+)50,75,000	Rs(+)3,28,29,000	Rs(-) 16,08,000
Number of trunk calls . ..		10·8 millions	..
Number of Telegrams—			
Inland . . .	23,823,715	..	..
Foreign . . .	4,577,476	..	..
Number of wireless messages		..	574,000

	Telegraphs	Telephones	Radios
Number of telegraph offices (excluding Railway and Canal offices on 31st March 1953) .	38,42	..	..
Number of telephone exchanges (Departmental) on 31st March 1953	..	565	..
Total Number of Telephones in India on 31st March 1953 .	--	201,000	..
Outturn of the three workshops in 1952-53	Rs 279 lakhs	..	..
Total Number of employees of the Department (all categories including postal on 31st March 1952)	..	219,710	..
Total number of gazetted officers	..	991	..
Telegraph channel mileage . .	261,363	..	..
Telephone channel mileage . .	..	171,119	..

TOTAL BUDGET 1953-54

(*Figures in thousand rupees*)

	For Deptt. as a whole	For Telegraph branch only
	Rs	Rs
Income	44,12,00	6,25,44
Expenditure	41,81,51	6,11,63
Surplus	2,30,49	13,81

VII. It began with A B C

THE TECHNOLOGY of Telecommunication includes the telephone, as it includes the telegraph and the wireless. The electric current is the common denominator. That is the reason why the postal system, although a first cousin, is not a blood brother; electricity does not flow in its veins.

In the history of inventions, the telephone is much younger than the telegraph. In the order of their introduction in India, the same time lag obtains. There is a difference of about 36 years between the births of the electric telegraph and electric telephone. If we recall the first experimental telegraph line built in India by Dr O'Shaughnessy in 1839, the first telephone line came in Bombay exactly after 36 years. And like a younger brother, the telephone was almost always dependent on the telegraph. Not only it formed an administrative part of the Telegraph Department to start with, in many early cases its lines were superimposed on those of the elder service.

Two startling contrasts will emerge out of this second part of the book. The telegraph, from its very inception in India, has been a government-owned public utility. Putting common weal first and the purse second, its emphasis has been on service even if it entailed loss of revenue. The telephone, on the other hand, was left to private enterprise, and a perusal of the following pages will show that the profit motive did not do itself proud at least in this case. New facilities were slow in coming, and new connections hard to get, because the private owners of the line could not be as sensitive to the public's convenience as the Government would have been.

The second contrast partly owes its origin to the first one. While the Indian Telegraph grew to be a giant, the Indian Telephone remained a dwarf, although it must be added in fairness that it is the dwarf that brings

home the bacon; telephone is the earning arm. The reasons for the retarded growth are set forth in passing, but the main cause must be mentioned right at the beginning. Among all the modern modes of communications and transport, the telephone is definitely a city-slicker. And India is largely villages. It is fitting therefore for the dwarf to bask in the reflected glory of the giant on the basis of the Indian joint family system when the latter celebrates its coming of age after first hundred years.

THE ANTE-BELLIAN

India's first 'private line', an ante-Bell contraption, supplied by the Telegraph Department was erected in August 1875 between the Fort office of the Peninsular and Oriental Steam Navigation Company in Bombay and its Mazgaon dockyard. The modern telephone had not then been invented and the instruments used were of the alphabetical dial type.

Other firms and companies followed the lead of the Peninsular and Oriental Company and private lines operated with 'A B C', or alphabetical dial instruments, soon became general in all the large cities of India. In this instrument the letters of the alphabet were arranged round a circular dial with a key opposite each letter and words were spelt out letter by letter by depressing the keys corresponding to the letter. The operation of the keys caused a pointer on the dial of the instrument at the other end of the line to move it, and stand at, the required letter until the next letter was signalled. It was a slow and laborious process of communication, but the business houses of that time apparently appreciated the additional means it provided for communicating with their branch offices. This was the forerunner of the modern telephone system, though by no stretch of imagination could the 'A B C' instrument of those days be called the ancestor of the streamlined telephone instruments we have now.

About an year after the first 'private line' in Bombay, in 1876 that is, Dr Alaxander Graham Bell perfected the electric speaking telephone in Boston, thousands of miles across the sea. Bell's principles were then embodied in a pair of crude telephone instruments connected by about 100 feet of wire, by means of which speech sounds were transmitted from one room to another in a building, a boarding house at Exeter Place, Boston, hearing being accomplished only with the greatest difficulty. The first words ever to be conveyed by telephone were accidental. His instruments in front

of him, Bell was working at his desk while inadvertantly he dropped some acid on the carpet. He called out to his assistant, in another room: 'Mr Watson, come here, I want you'. Watson got the S O S not through the pitch of Bell's voice, but through the instrument which was installed in his room. He rushed to Bell's room and beamingly announced, 'Dr Bell, I heard every word you said distinctly'. Thus history was made quite accidentally. Formerly, speech transmission involved a lusty shout, which reached as far as the next house; or it involved a megaphone which took the message a few hundred yards across. But a word spoken in the telephone, retaining its personal quality, could travel to the ends of the earth.

The art of speech transmission over a distance by electrical means, summed up in the telephone system, revolutionised our civilisation and our world. It changed the nature of human relations. Separation, which was an unmitigated sorrow before, became a sweet sorrow; the telephone was there to carry the quality and warmth of one's voice. Men began to live three days in one. Men could afford to be independent of their accidental neighbours and keep in constant touch with friends and relatives hundreds of miles away.

The media of mass communication have dissolved old barriers and tended to reduce the once colossal globe to a One World of near neighbourhood. By the same token, they have minimised the topography of individual ego, and almost annihilated the fertile field of privacy in which alone talent and personality can mature.

The invention of the microphone in 1877, and the rapidity with which it was improved and combined with the telephone, gave a new turn to events in the telephone field even in distant India. Various forms of apparatus obtained from England, America and elsewhere were tried out, while experiments with other designs were made by the Departmental Electrician, Mr Johnstone. It was an invention of his on Indian soil which was finally adopted. The alphabetical dial instruments were then replaced by the departmental telephones and the Department announced that it was prepared to undertake the business of supplying private telephone lines and exchanges; formerly there were private lines, privately owned.

Telephone lines were still connected with telegraph lines. The *Statesman* of April 15, 1878 noted that 'if the Ceylon system was excluded

there was an actual profit of Rs 19,995 in 1876-77, an year after the first 'private line'. A message dated July 12, 1875, in the same newspaper talked about several experiments with telephone 'between Lucknow and Sitapur, a distance of about 50 miles'. The message added: 'In one instance, the doors of the room in Lucknow in which the experiments were being carried out were shut and the plate pressed against the cage of some singing canaries. Every note of the canaries' songs were clearly heard at Sitapur'.

INFLUENCE OF CHAMBERS OF COMMERCE

Although a sister service to the Indian Telegraph, telephone was not made a Government monopoly, it remained a private enterprise for a long time. But it was the Government which leased out licences to private companies, mainly British. The nature of the industry required large organisation; the longer the range of a company the greater was the satisfaction to the subscriber. Hence, Government supervision was held essential.

Involved here was an oft-forgotten characteristic of the British Raj. Although the Civilians and the Military wielded unrivalled powers, the influence of the British commercial community in India was considerable. After all, what passed to the Crown in 1858, India, was consolidated by the Company Bahadur, a trading association. Until the eve of independence in 1947, therefore, the Chambers of Commerce formed powerful pressure groups; the Viceroy's annual address to the Bengal Chamber of Commerce was the supreme occasion for the enunciation of Imperial policies.

The pull of the commercial community was decisive in the character that the telephone system assumed in India. In November 1880 the Government of India informed the Bombay Chamber of Commerce that they were considering the question of introducing the telephone into India as part of the machinery of the Telegraph Department, thus making telephone also a Government-run public utility, and asked for an expression of the views of the Chamber. The Chamber of Commerce naturally replied that it was in favour of leaving telephone to private enterprise; those who had their eyes on the industry were also members of the Chamber. In accordance with this view, the Government of India granted permission to the Oriental Telephone Company in 1881 'to place telephone wires throughout the city, such permission to hold for a term of ten years'. This Company did not last long; in 1882 the Bombay Telephone Company, established with limited

liability under the Indian Company's Act, was formed with a nominal capital of 9·6 lakhs of rupees to acquire from the Oriental Telephone Company all the telephone exchanges and lines in Bombay and Karachi, together with the licences and rights granted to them by the Government of India. The India Government may have bowed down to the wishes of the Chambers of Commerce so far as the large cities were concerned, but it did not forget the smaller towns as the statement reproduced further down will show. The Government also insisted on running its own telephone system for its offices even in those cities like Calcutta and Bombay where private companies had been given a virtual monopoly. Moreover the Government kept under its control the provision of trunk lines. Private enterprise, however, in such a large-scale industry did not have a smooth sailing. Conflicts developed soon enough. But, first, let us have a look at the Telephone Exchange picture in 1881-82.

Licensed Systems

	No. of Subscribers	No. of exchange connection	No. of private lines	Amount received
				Rs
Calcutta . . .	102	101	2	32,215
Bombay . . .	90	87	3	25,194
Madras . . .	24	28	..	6,650
Rangoon . .	17	17	..	6,250
Karachi . . .	11	11	..	2,700
Total . .	244	244	5	73,009

Government Telephones

	No. of Exchange connections			Total Ex-change con-nec-tions	Public Lines		Private Lines		Amount Realised
No. of	Ex-changes	Pub-lic	Pri-vate		No. of cir-cuits	No. of offi-ces	No. of cir-cuits	No. of offi-ces	
									Rs
1881 . .	4	24	..	24	11	16	26	51	19,808
1882 . .	8	45	11	56	42	65	46	82	40,069
1883 . .	12	81	11	92	48	74	41	74	47,131

The licensing of Private Telephone Companies brought in its wake several problems like effective Governmental control, extent of departmental monopoly, assessment of royalty, rivalry between companies, etc. The following excerpt from old Government of India, Public Works Department records, to which Telegraph Department was then attached, tries to reiterate Government's sole monopoly over communications, as it exists today. *Inter-alia* it bares the basis of the Simla Resolution of October 25, 1883:

> 'In November 1881, licenses were granted by His Excellency the Governor General in Council to the Oriental Telephone Company, under which Telephone Exchanges have been established in Madras, Bombay, Calcutta and Rangoon. Permission was also given to the Oriental Telephone Company to establish and work under separate licenses in each case, private telephone lines within the areas defined in the Telephone Exchange licenses held by the Company. During the past year, various questions have arisen with regard to the further development of this class of enterprise and His Excellency the Governor-General in Council is pleased to lay down the following general rules under which licenses for similar purposes will be granted in future.

'The Government of India have expressly laid down that they will not give to any company a monopoly for Telephone Exchanges. They reserve to themselves full power to erect one for themselves anywhere or for the public in any place for which no license has been granted to a private Company, as also to grant licenses to more than one Company on due application.

'That in the event of any private Company wishing to work Telephone Exchanges in any city, in which the Government has already established such an institution, the Government of India will be willing to treat with any private Company, capable of working it properly, for a transfer of the exchange.

'While the Government of India has no desire to compete with private enterprise in the matter of Telephone Exchanges in this country, it reserves to itself the right to undertake such business in places where private agency is not prepared to take it up.

'So long as the business is conducted satisfactorily and on terms sufficiently advantageous to the public, there will be no necessity for departing from the practice hitherto followed in this matter ; but in view of the desirability of securing adequate protection of the public interests, it is necessary that full discretion should be reserved to the Government to step in and undertake the carrying on a telephonic communication in the event of failure, overcharge, or other misconduct on the part of a Company.

'The construction, maintenance, and working of all exchanges for, and lines between, Government offices will be undertaken in all cases by the Government Telegraph Department.

'When connections are desired between towns each possessing a licensed exchange, the trunk line of communication will, in all cases, be erected, maintained, and owned by the Government Telegraph Department, and let to the Company at an annual rental.

'But it must be understood that no Company has a right to claim the erection of a trunk line, and that the State is free to approve or decline in each individual case.

'The royalty fixed in the licenses to the Oriental Telephone Company is at the rate of 10 per cent. With a view to encouraging the development of telephone enterprises, companies obtaining licenses in future under the conditions now laid down will be required to pay a royalty of 5 per cent; with an additional royalty of 1 per cent on ultra-radial connections.

'In all future licenses, it will be expressly stipulated in accordance with the English system, that in case of purchase of the Company's property by the Government, nothing will be paid for the 'good-will' of the business.'

In the Presidency towns, facilities were accorded since 1884 to subscribers to the Telephone Exchange to receive or send their telegrams by telephone. For this purpose the Central Government Telegraph office was connected to the telephone companies' exchanges by one or more wires. The rates for these facilities were moderate, and during 1895-96, 34,458 telegrams were received for transmission at Bombay and Calcutta and 20,520 telegrams were delivered by telephone in these two cities.

The contradictions inherent in a public utility of utmost importance in private hands were tolerated for full 60 years. The process of nationalisation began shortly before independence. From 1st April, 1943, the Government of India exercised the option to purchase the assets of various Licensed Telephone systems in India operated in Madras, Bombay, Calcutta and in other cities. They took over Bombay, Madras and Calcutta Telephone Systems. Judging from the speed of nationalisation in other fields, this was indeed a belated move; the influence of powerful British commercial interests was at work.

ASSIST TO ALL-INDIA RADIO

Although broadcasting is a function of a separate Ministry, quite independent of the Post and Telegraph Department, the Trunk lines of the latter were frequently used for broadcasting identical programmes simultaneously to several stations.

Trunk Telephone Lines were used for relaying wireless broadcast programmes between principal broadcasting stations in India for B.B.C., London, and N.B.C., New York, in 1936-37. Programmes that came over the Indian lines included: Commentary on the arrival of Lord Linlithgow, Viceroy-designate, at Bombay, for B.B.C., London; Commentary on a Cricket match at Colombo for B.B.C., London; Commentary on the United Provinces elections from New Delhi Studio, for N.B.C., New York; Commentary on the Kadir Cup from New Delhi Studio for B.B.C., London.

During 1937-38, there were several hook-ups involving most of the Indian Stations, as well as an All-India hook-up for a speech broadcast by the Viceroy from Simla in June 1937. For the entire linking-up of stations, the trunk telephone circuits were freely utilised. The trunk network for the All-India hook-up involved 11,000 miles of lines and several amplifying stations; and alternative routes in case of interruptions had to be kept in readiness. It is a proud record that almost all the programmes went through without any hitch. His Majesty's Coronation broadcast, the Empire Day broadcast, the relay of the Derby Race, King Emperor's Christmas message and Lady Linlithgow's broadcast in aid of anti-tuberculosis fund were some of the features. It will be noticed that Nationalists were not yet allowed an access to broadcasting.

VIII. Step by Deliberate Step

CONFINED TO a fortunate few, and first operated as less than a full 24-hour service, the Indian telephone wobbled like a ponderous elephant. But like an elephant, it forgot nothing of latest inventions, and eventually caught up with them. The early development was especially slow. There was an initial, and perhaps unavoidable, handicap; most of the instruments were magneto-telephones. It was not like starting with its best foot forward. And once a slow and cumbersome system was adopted, it was too challenging and too costly to turn to more advanced and satisfactory methods.

Most exchanges, moreover, served the subscribers on a part-time basis, generally for eight hours in the day, from nine to five. The motive was to keep down operation costs and to avoid shifts among employees. By 1899-1900 there were 43 Departmental Exchanges with 421 exchange connections and 511 private line offices bringing in a revenue of Rs 154,133. The Telephone Companies at Calcutta, Madras, Bombay, Karachi, Ahmedabad, Rangoon and Moulmein earned Rs 411,334 with 2,005 exchange connections and 273 private lines. A number of Departmental public call offices were also functioning at Mussoorie, Landour, Dehra-Dun, Kulri Bazar and Barlowganj.

Telephone revenue everywhere in the world is closely linked with the commercial activities of a nation and India is no exception. In 1906-07, the British Empire had entered into an era of prosperity. The Boer War was over and the Empire was basking in the sunshine of the Edwardian era. That year proved to be a boom year in the Telephone history of India. Revenue collected during the calendar year 1906 by the Departmental exchanges amounted to Rs 266,533, nearly 13·5 times the revenue earned in the first year of introduction of the telephone service.

From 1st January, 1907, uniform rates of Rs 120, Rs 135 and Rs 150 for 8, 16 and 24 hours' services respectively were introduced for all connections not exceeding two miles in length from the Departmental Exchange, irrespective of the number of calls. From the same date the rates for internal installations were revised on the basis of working hours; Rs 45 per transmitter and receiver per year on Exchange connections worked by Telegraph Department; Rs 90, Rs 101 and Rs 112 per connection per year for 8, 16 and 24 hours' service respectively on Exchange connections not worked by the Telegraph Department.

But the boom was short-lived. Came the 1st World War, 'the war to end all wars'. Financial stringency was always dogging the Indian telephone's steps. A number of orders were placed in European countries in 1920-21 for Auto, C.B. and Magneto-equipment of various sizes to the tune of £140,000. But due to financial stringency and curtailment of grants for construction of buildings, revenue-earning plant had to be held up and no plants were received during that year. Since then the pattern has practically remained the same. Never has the telephone branch been able to catch up with the demands. Among prominent reasons have been lack of funds and the deliberate turning back by our British masters in the twenties of the present century on the policy of manufacturing equipment in India which had been fostered so far as Telegraphs were concerned.

THE 1921 NETWORK

On the 31st March 1921, there were 255 exchanges with 10,703 connections owned and maintained by the Government of which 146 small exchanges with 1,274 connections were not operated by the Department. There were 320 independent non-exchange systems with 1,092 offices. The gross rental during 1920-21 from telephones excluding those supplied to Railways and Canals was Rs 1,484,417. The licensed telephone companies owned 11 exchanges with 20.335 connections and the revenue earned by them was Rs 3,491,264. The receipt from Trunk lines for this year amounted to Rs 217,186 and the total length of trunk wires came to 5,611 miles. A decision was then taken to separate telephone accounts from the general accounts of the Telegraph Branch.

Developments in Telephone techniques was going on apace. The single wire telephone system of 1880's gave way to the two wire system around

1900; the cumbrous magneto instruments were replaced by the central battery system a little later. In the meantime the automatic system which dispensed with the services of the 'Hello' girl was being developed in England and America. It was in 1914 that the first automatic system was introduced in India. It was a Keith Line automatic system and was installed at Simla. It was followed by an RAT System which was installed in the Government House, Poona. Automatic Systems were subsequently installed also in Ootacamund, Coonoor and Allahabad.

This was followed by installing auto exchanges at other places, notable amongst which were Delhi, Lahore (now in Pakistan). The telephone companies in Bombay and Madras were also progressive in this respect and the manual systems at these places were replaced by automatic in the first quarter of the twentieth century.

Calcutta has been less fortunate. It is a perfect example of how commercial interests can override public interests. Though the necessity of converting the manual system for such a large city as Calcutta into an automatic one was recognised as early as 1933, it is said that the company refused to consider it because of the rumours that the Government might take it over. The company was taken over in 1943 but nothing could be done to modernise the system as equipment was not forthcoming due to the war and its aftermath. It is in the fitness of things that the year which marks the century of progress, is also the year when Calcutta is having its first automatic exchanges.

TELEPHONES VERSUS CHAPRASIS

The following remarks from the Department's 1922-23 Records regarding the curtailment of the use of telephones by other Departments expose one of the Indian traits which have impeded the spread of telephones in this country:

> 'The policy of certain Departments of the Government of India and of some local Governments in reducing the number of telephones supplied to their staff is a most unwise one. The usefulness of a telephone system increases enormously in proportion to increase in subscribers and it is only when all the persons, with whom any one wants to communicate, are on the telephone that a really substantial saving in postage and the wages of messengers can be effected. The

> Department has incurred heavy expenditure in erecting telephone exchanges and trunk lines throughout the country and the laest that it can expect is the support of Government Departments. Without this support, development must be retarded as is the lead given to the public. It is sincerely to be hoped that the policy of petty economy with respect to this most valuable aspect of inter-communication will be abandoned and that the connections that have been given up will be renewed next year.'

The comment initiates a great economic debate on the Chaprasi *versus* the Telephone. In most Western countries, even the big shots transact business on phone, thus saving on men-hours and postage, ensuring greater efficiency. In the Central Secretariat in Delhi, even junior officers have Chaprasis sitting outside their rooms. For every little thing a Chaprasi makes a tour of half a mile involving half an hour, while the same work can be accomplished in a minute over the phone. Most of the Chaprasis, moreover, are illiterate, and so the officer has to spend more time correcting their mistakes (in delivering files and messages, etc.) than it would take him to transact the business on the phone. It may be true that in the Indian economy based on over-abundance of manpower, the abolition of the Chaprasi system may result in greater unemployment. But looking at the efficiency connected with telephones and the slow-down effect on all work by the institution of Chaprasis, it might be more economical to place the latter on relief rolls. In fairness it should be added that the latest tendency in Government departments is to ask for more and more telephones, but the Posts and Telegraphs does not yet possess enough resources to fulfil all their demands.

THE LONG DISTANCE DIALLING

There were automatic telephone exchanges at Lahore Cantonment and Lyallpur. This equipment at the Cantonment worked in conjunction with Lahore Auto-Exchange (Strowger Plant). As early as 1923 the Department had designed circuits which provided inter-dialling facilities between subscribers of both the exchanges. This was not all. Lyallpur subscribers, who were about 90 miles away from Lahore, could be directly dialled by the Lahore Trunk Exchange. India has unfortunately retrogressed rather than progressed in long distance-dialling. We do not have the system any more,

the main reason being the paucity of long distance circuits. However, the 10-year programme of the Colombo Plan has lent us the services of an English expert from the British Post Office to help us start on the path of distance-dialling once more, and it is hoped that in the not so distant future it will be possible for a citizen of Delhi to get a party at Bombay or Calcutta by dialling directly.

The first trunk telephone circuit in Burma was established between Rangoon and Pegu by a super-imposition on telegraph wires, and though faulty, the measure made for economy. The circuit was opened to public by December, 1923 and earned a revenue of Rs 571 on 761 calls.

Experimental research on Telephone Repeaters and composite working carried on in Departmental workshops produced several results in the same year. It was found at the Calcutta laboratories that Oxide-coated American Valves together with the British Post Office Repeater gear gave very suitable results on the long aerial lines in India. Excellent commercial speech could be maintained with this combination, so long as the distance between the Repeater stations did not exceed 12 to 15 miles of Standard Cable. As a consequence of these experiments, Telephone Repeaters were installed in Lahore and Delhi to furnish inter-provincial trunking facilities between telephone exchanges in the Punjab on the one side, and those in the United Provinces of Agra and Oudh on the other. Excellent commercial conversation could be carried on between Simla and Rawalpindi through the Lahore Repeater. As an experimental measure, Telephone Repeaters were also installed in Agra and Ratlam and it was found possible to maintain good communication between Simla and Delhi on the one side and Bombay on the other. But the lines on which the Repeaters were installed were subject to frequent disturbances. A uniformly efficient service was not possible.

After a series of experiments with a view to ascertaining whether ordinary Magneto-Telephones could not be used on combined office circuits, both for calling up and for conversation, a circuit arrangement was evolved with the aid of 5A, Retardation Coils, by means of which it was possible to establish good telephonic communication between offices on omnibus circuits (with ordinary Magneto Telephones), so long as the distance between them did not exceed 14 to 16 miles of Standard Cable.

A cordless trunk switchboard, which improved the efficiency of the trunk service, called the 'long distance' in U.S.A., was installed at Simla

during the early part of 1928. The Board reduced the strain on the operators and increased efficiency.

DECADE BEFORE THE WAR

On 22nd March, 1930, a single channel carrier system was installed as a tryout between Delhi and Agra to obtain an additional telephone channel without the erection of new wires. Speech on the circuit was found to be fully 'commercial,' and upto the standard obtainable on a physical circuit. It gave the minimum satisfaction, but it was inadequate for finer things like music.

Carrier current system of working was introduced between Calcutta and Bombay in 1931-32 when four High Frequency Carrier Telegraph Channels and one Voice Frequency Telephone Circuit were provided on the same pair of overhead wires. The development and economical expansion of the Telegraph and Telephone systems were advanced a stage further when three more high frequency carrier telephone channels were added in 1934-35.

On 1st May 1939, the Indian Radio and Cable Communication Co. operated Beam Stations for Radio Telephone Communications between India and England. A special Trunk Exchange was installed in Kirkee for controlling Overseas Telephone calls.

The Indo-Burma Radio Telephone Service at Madras was opened on 29th December 1936. It was subsequently extended to all places in India, Ceylon and Burma, which were then served by ordinary trunk service.

Centralisation of Telephone Revenue Accounting work took place in 1937, and the Central Office began to function in Delhi by July of that year. This office dealt with 95,700 rent and 2,31,500 Trunk Call bills during the very first year.

This was the pre-war picture. There were 282 Departmental Telephone Exchanges with 26,729 straight line connections and 4,089 extensions. There were in addition 320 branch exchanges of the Posts and Telegraphs Department for the exclusive use of Government Departments, Municipalities, business firms, etc., with 3,683 telephones. The total revenue earned during 1937-38 was Rs 5,616,000 from rents, and Rs 5,792,000 from calls fees, aggregating to Rs 11,408,000. The average time of maturing of 59 per cent. of Trunk Traffic was about 10 minutes after booking.

IX. The Big Cities

EMERSON MUST have had telephones in mind when he remarked that 'cities make men talkative'. There cannot be a greater symbol for man's capacity to gab than the telephone, and if talkativeness is especially an urban attribute, so is the telephone. Although the early Indian culture was developed by the forest-dwelling Rishis, in the Western world the city is regarded as the fire-place of civilisation. And modern civilisation as we know it would be unthinkable without the telephone which takes a pervert's pleasure in tinkling inevitably when one is in the bathroom. A man can be more lonesome in a metropolis than in a hamlet, and the telephone comes to his rescue.

The Five-Year Development Plan of the Posts and Telegraphs aims at taking the telephone line to thousands of India's villages, and that very fact brings out in bolder relief that the Indian telephone by and large has so far been confined to the big cities. The private companies in charge of early adventures could not think of going beyond a handful of large cities. It would have been uneconomic.

In November 1881, licences were granted by the Governor General in Council to the Oriental Telephone Company Limited, a British firm, to establish exchanges at Calcutta, Madras, Bombay and Rangoon. The Crossley Company was also granted licence for Calcutta. The licence granted to the latter Company lapsed but the Oriental Telephone commenced operation at once and established exchanges in those large cities. In 1882 an Exchange was opened in Karachi. Telephone is largely an urban instrument even today. The rural life being slower; this time-saving device is not in much vogue in villages. In those early days, this was even more true. *Times of India* wrote about the opening of Telephone Exchanges at Bombay, Calcutta and Madras on 28th January 1882:

"History Today

Monday, 30th January, 1882.

Opening of the Telephone Exchange at four O'Clock on Saturday afternoon.

"The Bombay Telephone Exchange was formally opened, but in a very quiet manner. A few gentlemen assembled in the office of Messrs Ben Ashley & Co., the local Agents of the Oriental Telephone Company.

" Arrangements had been made to keep the telegraph wires from Calcutta open, and very shortly after four O'Clock the following (Telegraph) message from Calcutta was telephoned through the Bombay Telegraph Office to the Telephone Exchange where it was received and read out by Mr. Chalmers :—

' Mrs. Baring Calcutta, to the Telephone Bombay : I have the pleasure to declare the Bombay Telephone Exchange open this day and I offer my congratulations to the commercial community on the successful inauguration of a telephone exchange in Bombay.'

" For about an hour the request from one member to be put into connection with another came pouring in rapidly, but only with a view to test the working of the instruments and wires and the messages exchanged were of a private, rather than a business nature."

The gradual expansion brought in Central Battery systems in the Departmental exchanges. Juice was supplied to each section from the Central Station. Three such switch-boards of the latest type with accessory plants were obtained. Cawnpore was the first among the big cities to have a 24 Volts C.B. Exchange. Indeed the Cawnpore Exchange was opened in August 1907, but we will come to cities with earlier beginnings a little later.

Let us also take Lahore before Bombay and Calcutta. The Lahore Automatic Exchange installed in 1919 worked well enough to prove that it could weather adverse Indian climatic conditions, including dust and humidity. During the summer months the heat was intense and the atmosphere full of suspended dust. Even after all precautions to prevent the dust entering

the switches and apparatus had been taken, a considerable amount of trouble was experienced. An electrically operated Vacuum Cleaner was obtained from England. The following year a 400 line C.B. Multiple Board was installed at Raisina in New Delhi.

BOMBAY CALLING

The Bombay Telephone System had only 90 subscribers on its role when it opened on 28th January, 1882. During its first year it collected a revenue of Rs 25,194. The first Telephone Exchange system operated on Law's Call Wire Equipment. In 1882-83 four exchanges using similar equipment were added. From 1883 onwards the Law's Call Wire Equipments were changed to Magneto Equipment using a single wire with an earth return. All these wires had to be carried overhead, but even at that time it was felt that they should be replaced by underground cables, an improvement for which Bombay had to wait until 1905.

Around 1906 the Central Exchange, by then very large, came into existence on its present location using Magneto Lamp Signalling Equipment. Other smaller exchanges round about gradually closed down, and all the subscribers in the Bombay Island, some 1,600, were concentrated on the Central Exchange. In 1908 the Bombay Tramway began to roll and it caused considerable interference to the telephone service over the single wire earth return circuits; the use of two wires in underground cables was to prove the answer.

Two more exchanges at Bandra and Ghatkopar were opened in 1910-11. By 1921 the Bombay Telephone Company was serving 6,000 subscribers and it was found necessary to resort to Central Battery working. The Company took a progressive step in having two of the largest exchanges, Central and Gell Street, automatised. A total of 11,000 lines of equipment began to work on a five-digit number scheme. Equipment employed was Strowger Bay Type. From the recovered Central Battery Equipment of the Central and Gell Street Exchanges, a number of small exchanges were opened in the Salsette Island off Bombay to cater to the growing demand from the public.

By 1928 party lines were introduced to provide telephone facilities at cheaper rates. Automatic Exchanges were installed at Naigaum, Andheri, Ghatkopar and Bandra, from part of the equipment of the Gell Street Exchange which had become surplus due to the trade depression of the early

'thirties. Two of the Central Battery Exchanges at Salsette Island had to be closed down also because of the Great Depression.

Automatic announcement of time by gramophone records was started in 1932 in the Central Exchange, and the service was gratis. By 1935 open rack pre-2000 type Strowger Equipment were installed on a wide scale. The Central and Gell Street Exchanges were extended, and Naigaum received new equipment. Another new exchange was added during 1937 having a mixed 2000-type and pre-2000 type equipment at Kandivali. By 1940 the Colaba Exchange was ready, using entirely pre-2000 type equipment. In 1941 the message rate system at the option of the subscribers was introduced.

The Government of India exercised their option under the licence and purchased the Bombay Telephone System along with other company-owned systems in April, 1943, and the entire system came under the Indian Posts and Telegraphs Department. The principle of running public utility services by the Government for the benefit of the public was at long last fully realised. Due to World War II, additional equipment could not be commissioned although there were heavy demands. By March 1951 there were 9 exchanges with 29,300 connections. In order to accelerate the heavy expansion programme of the Bombay Telephone System, a separate Planning Unit was formed on 1st July, 1951.

'HELLO, CENTRAL?' IN CALCUTTA

One hundred and two subscribers to the credit of the Calcutta Telephone System made it the largest unit on the list of the Oriental Telephone Company in 1881. It also earned the better part of the revenue of the Oriental. But by 1883 the licence passed into the hands of the Bengal Telephone Company which, around 1922, was rechristened 'Bengal Telephone Corporation'. The latter's reign lasted until 1943 when the Indian Posts and Telegraphs Department took over the ownership and management.

In 1890 the number of exchange and private lines in Calcutta totalled 437 and by 1900 had it risen to 821. A small exchange was opened in Howrah in 1892. Budge Budge, which had telephone service since 1892 by a Public Call Office connected to Calcutta, had its own exchange in 1904. The early exchanges were Magneto type and this system was maintained till 1920. Of course technical improvements were introduced as the service expanded; underground cables, for instance, were laid as early as 1903. The Central

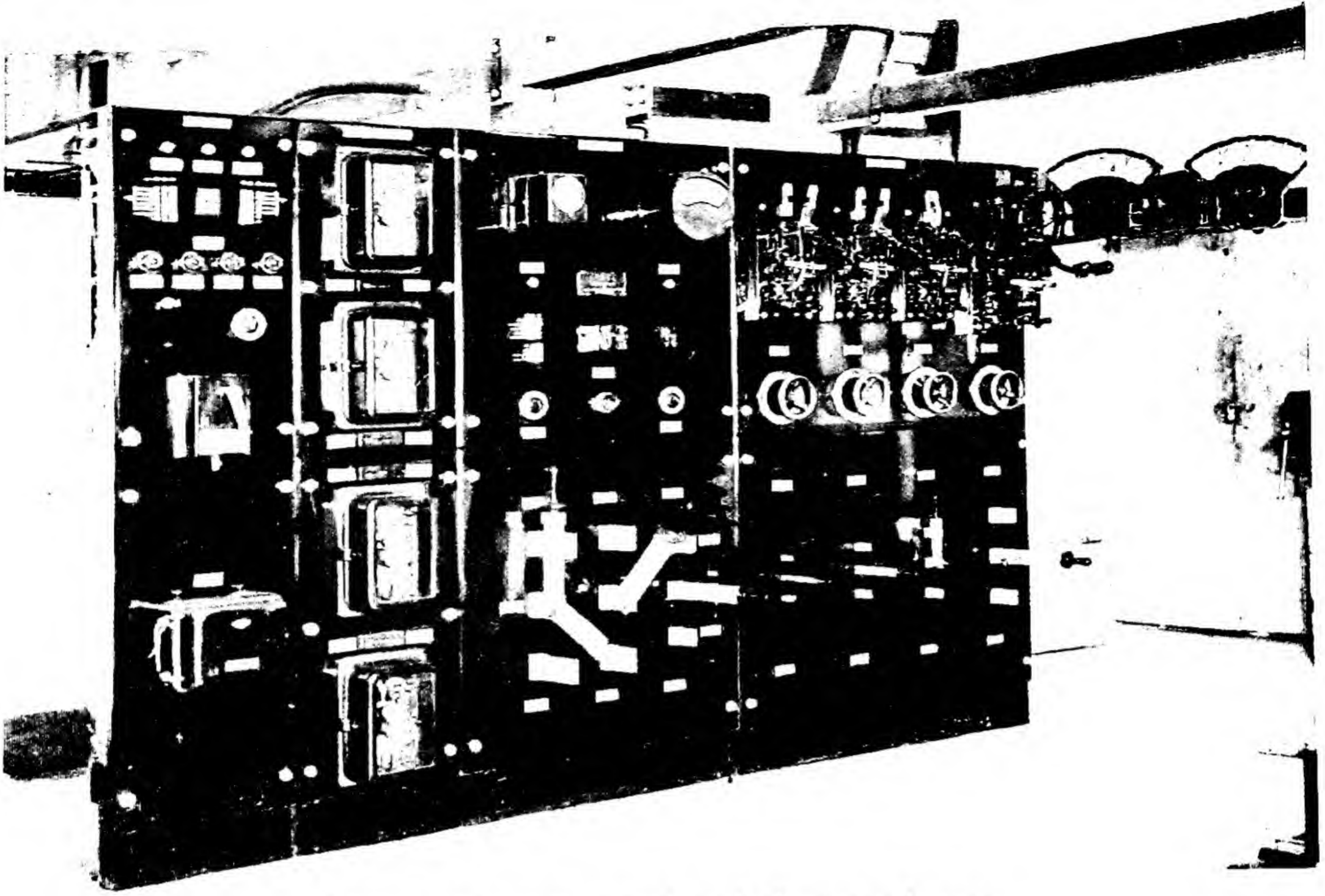
Battery Exchanges were inaugurated on 21st April 1921. The Calcutta Exchange in the Hare Street was opened at the same time and it was reaching subscribers at Burra Bazar also. During 1924, a separate Burra Bazar Exchange in the Central Avenue and South Exchange were opened partly to assuage the increasing public demand. 1929 saw the formation of the Park Street exchange; the Calcutta subscribers' list had grown to 10,000.

Somehow the Burra Sahibs of the Bengal Telephone Company never took kindly to the idea of automatisation and it was left to the Government to sponsor the scheme after it purchased the system. The expansion continued at a vigorous speed and it was decided by the Department to convert the Calcutta System to automatic working; in 1945-46, the Telephone Manufacturers of India Ltd. (a British firm) was given a contract for the preparation of a master plan for the complete conversion of the present antiquated manual system by an automatic one. The plan was completed by 1945-46, and a new branch under an Engineer-in-Chief, Calcutta Automatisation, was opened, augmented with the services of some British Post Office Engineers for detailed planning and supervision.

A great calamity struck in 1948. Fire broke out in the Calcutta Exchange, the largest of the exchanges catering to nearly 20 per cent. of Calcutta's telephone users. In no time the leaping flames completely destroyed it. The skeletons of the burnt-out exchange symbolised the partial paralysis of that great metropolis. The Post and Telegraph went to work and immediately provided relief by drawing on her resources all over India. Smaller exchanges to replace the burnt-out one were installed in a matter of months and telephone service restored to almost all the clients. The work is a marvel of improvisation.

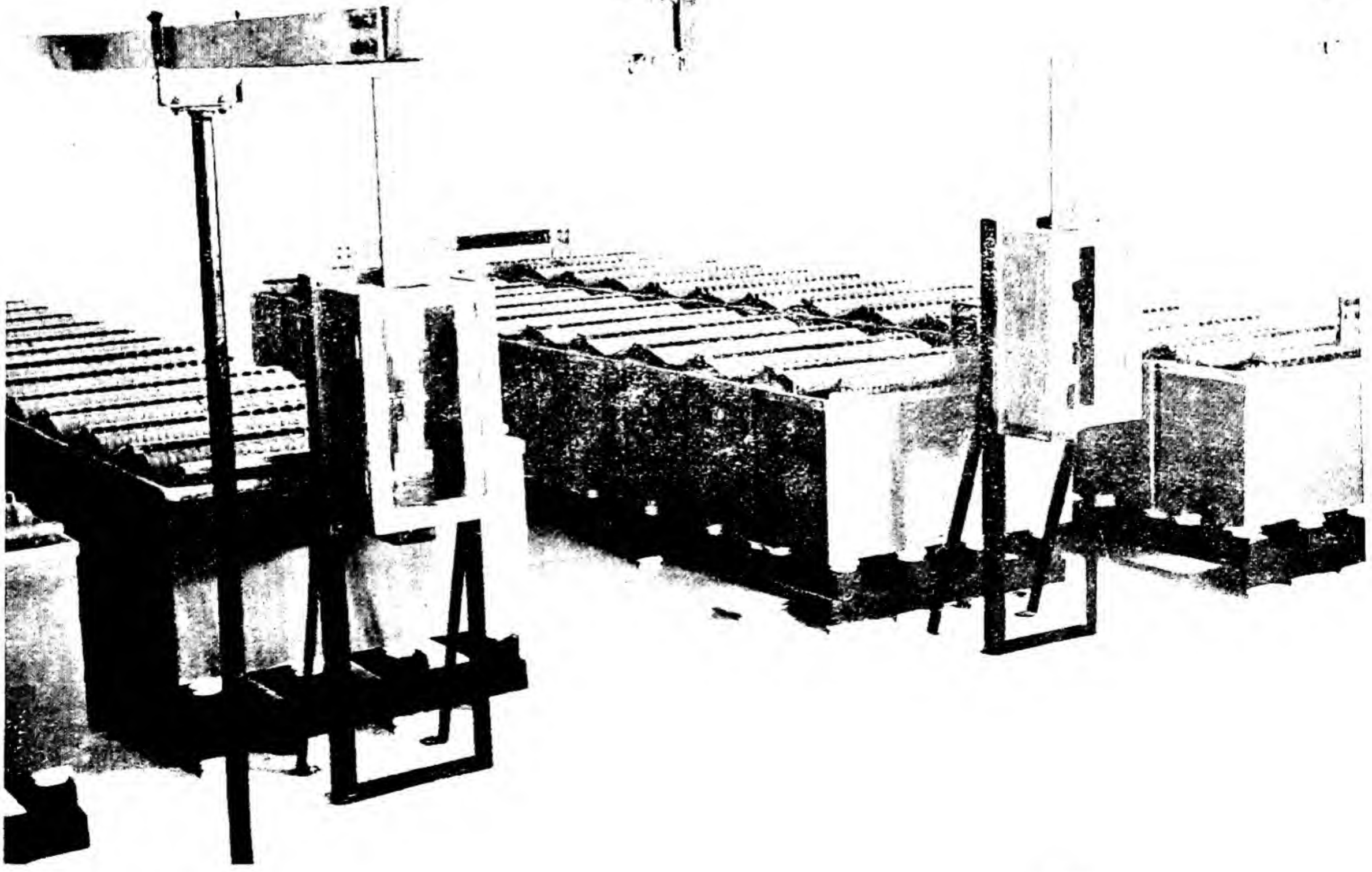
From the embers of the burnt-out exchange, new plans rose like the proverbial phoenix. Schemes for the future envisaged 22 new exchanges, providing 56,000 subscribers' lines. In December 1949, multi-storied buildings began to rise in Dalhousie Square and at Chittaranjan Avenue. In May 1953, two more Manual Exchanges were opened to give interim relief, totaling the capacity to 11,000 lines.

May 30, 1953, was a red letter day in the city which was once the leading metropolis east of the Suez, and which even now is the largest city in India. That teeming business and industrial and cultural community had to put their calls through the exchange middlemen, thus losing precious minutes, a

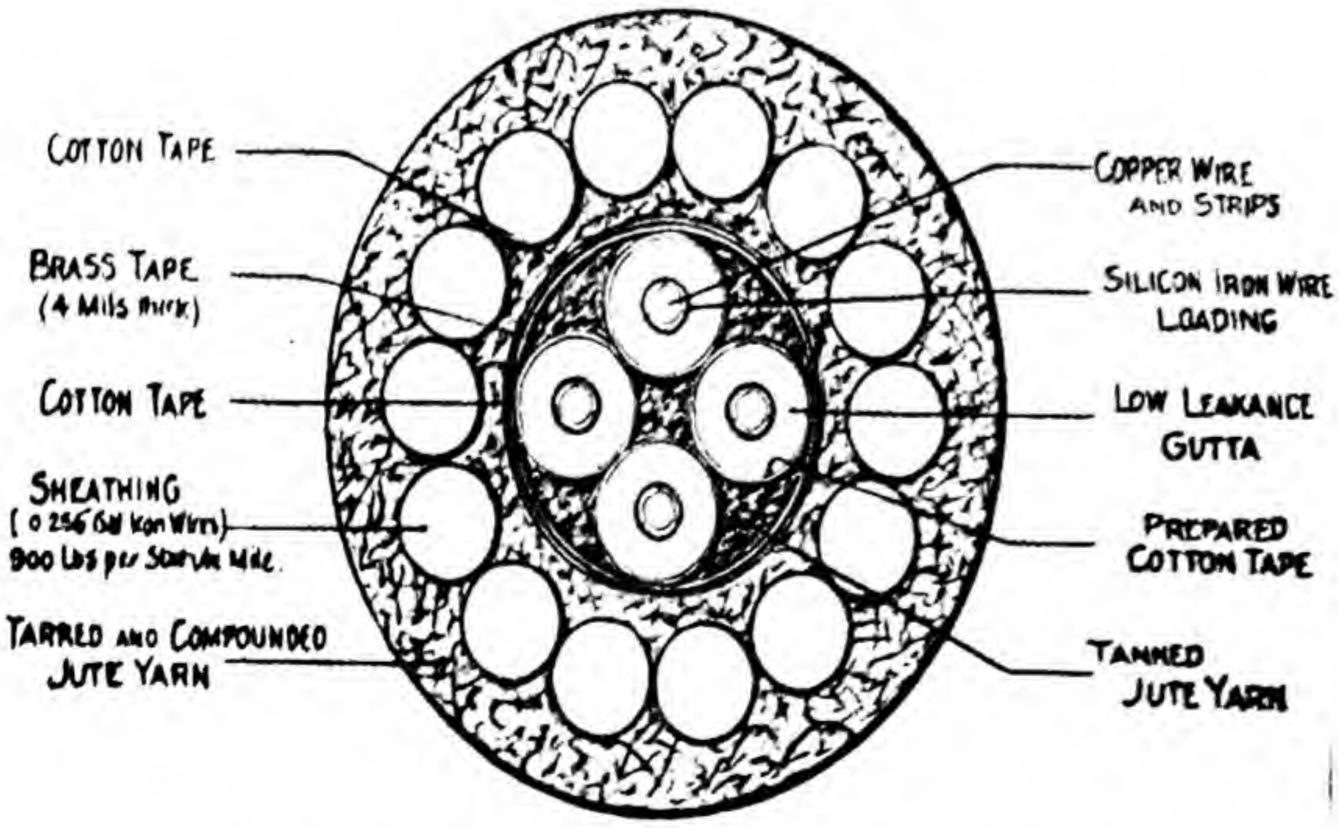


Power control board of a telephone exchange.

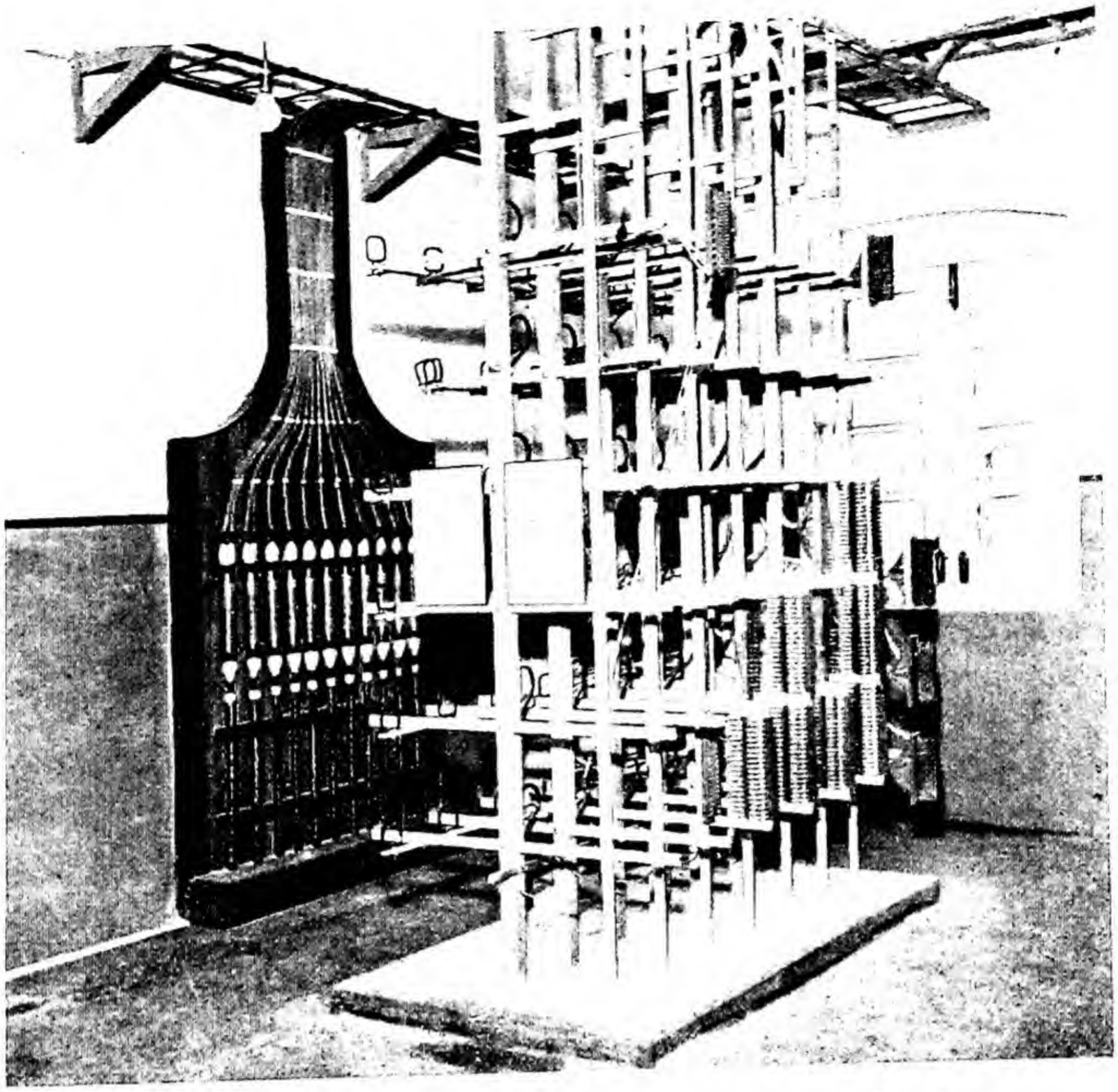
The batteries lead accumulator batteries in a big Automatic exchange



Under-water trunk cables. This cable was laid across the Ganges at Mokammeh Ghat in 1949—top right and centre left—show the shore ends being laid—centre right—the bridge of boats over which the cables were laid in shallow water—the boats were subsequently removed and the cable dropped in position—centre left bottom—cable being taken out of the lighter and being laid on a "chur" in the middle of the river—bottom right—cable being taken through shallow water over bamboo "cainchees".

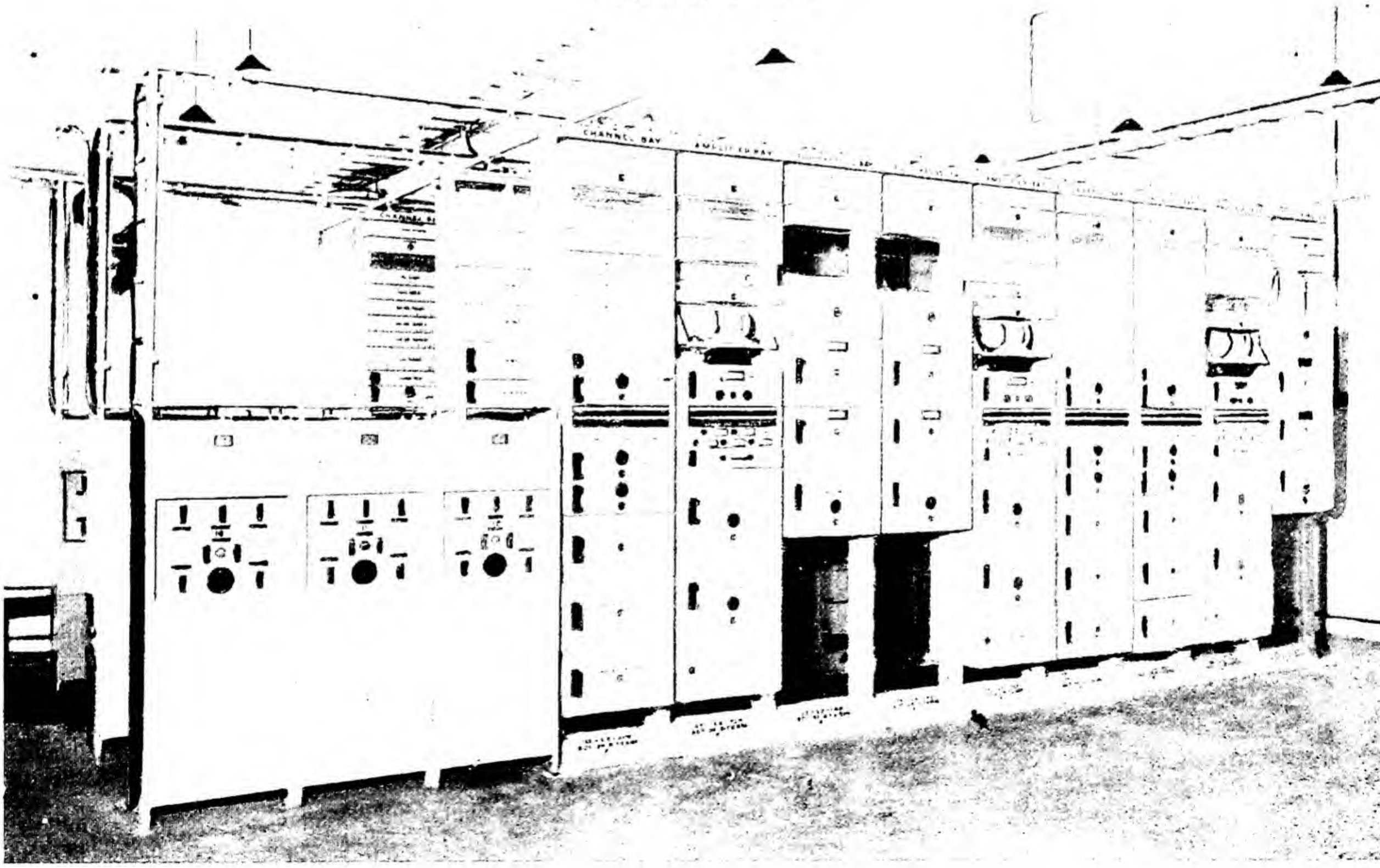


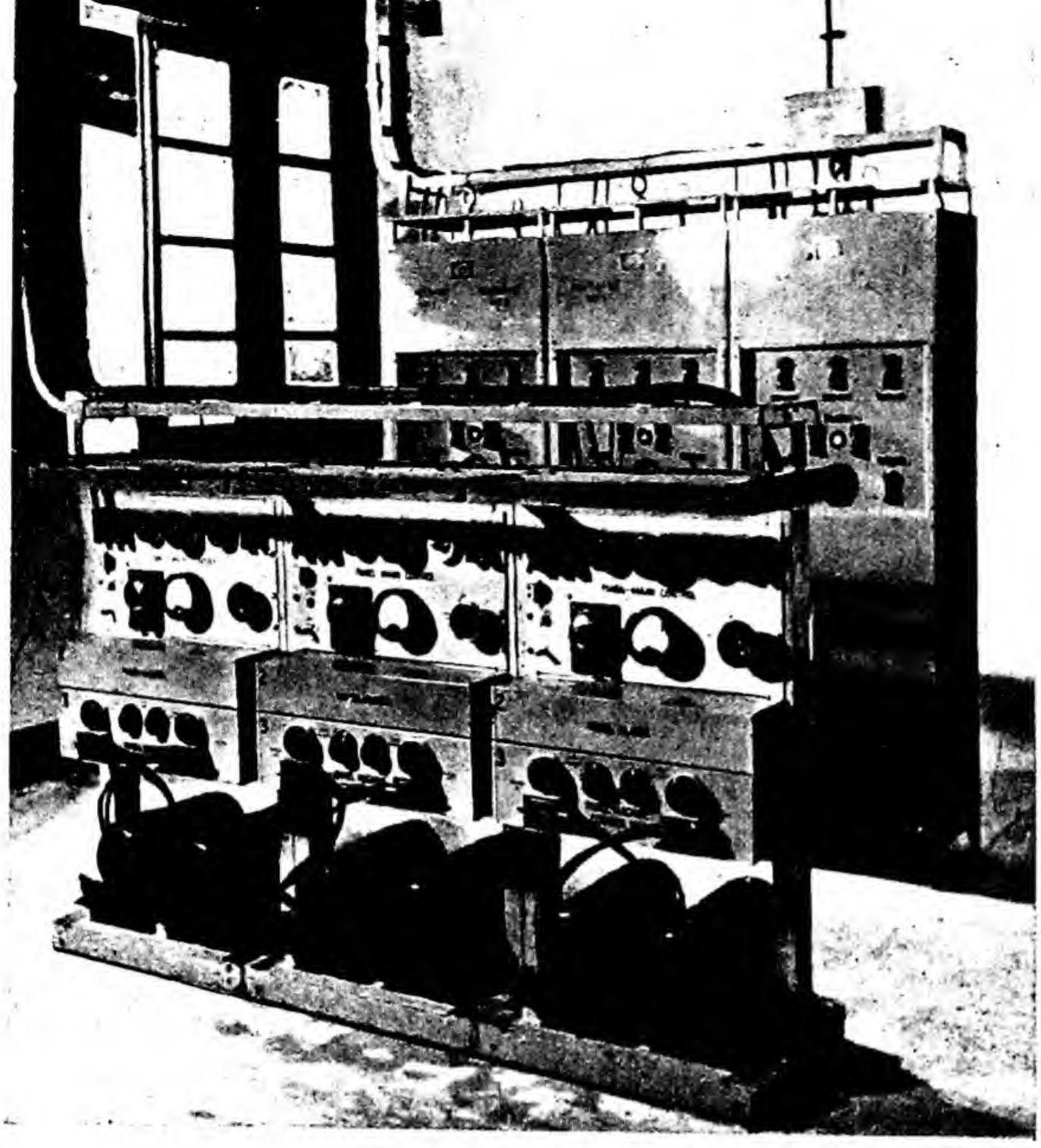
Cross-sectional view of Cable showing the materials used (full Size)



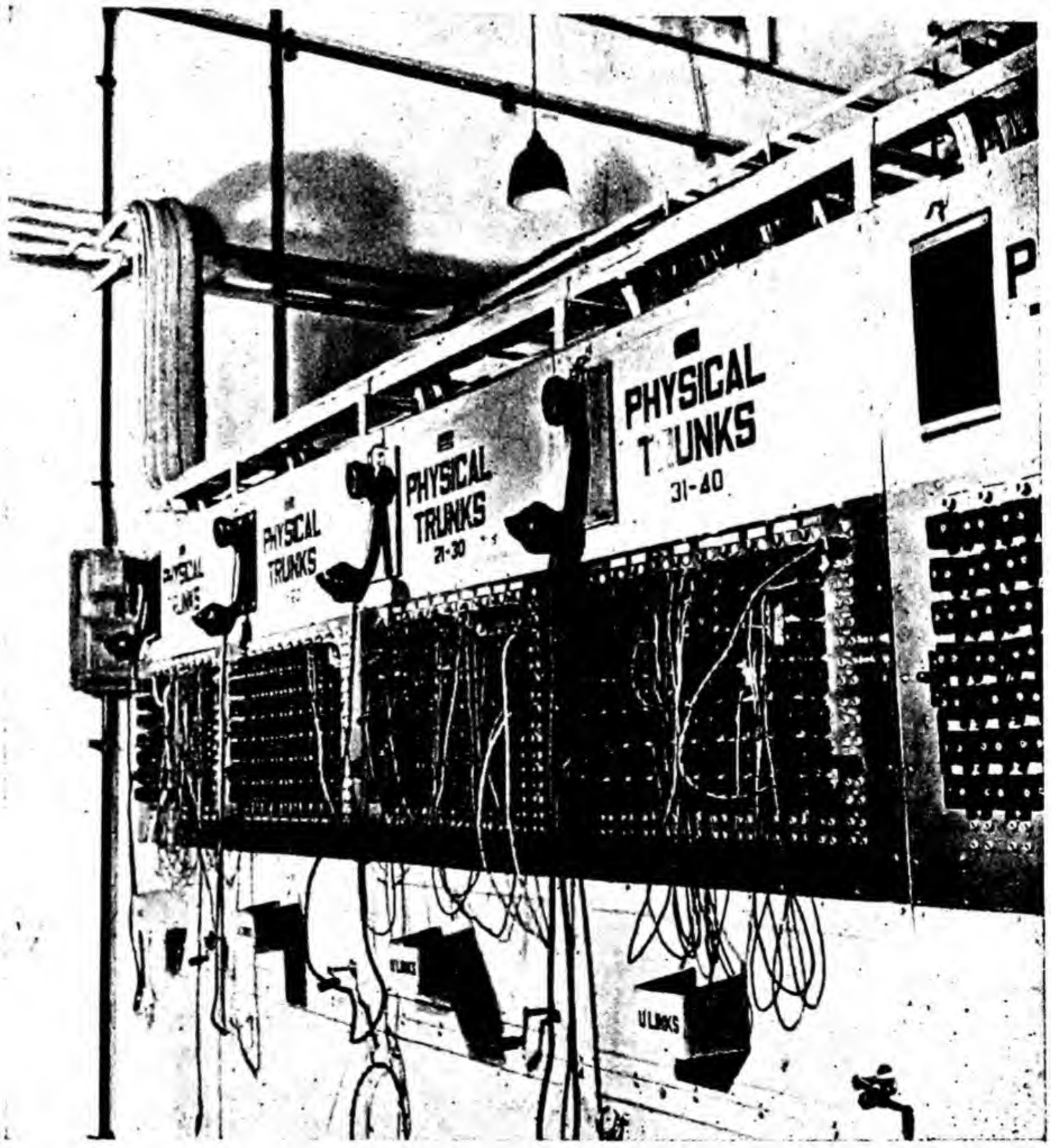
Distribution frame in a Carrier Repeater Station

A Carrier Station

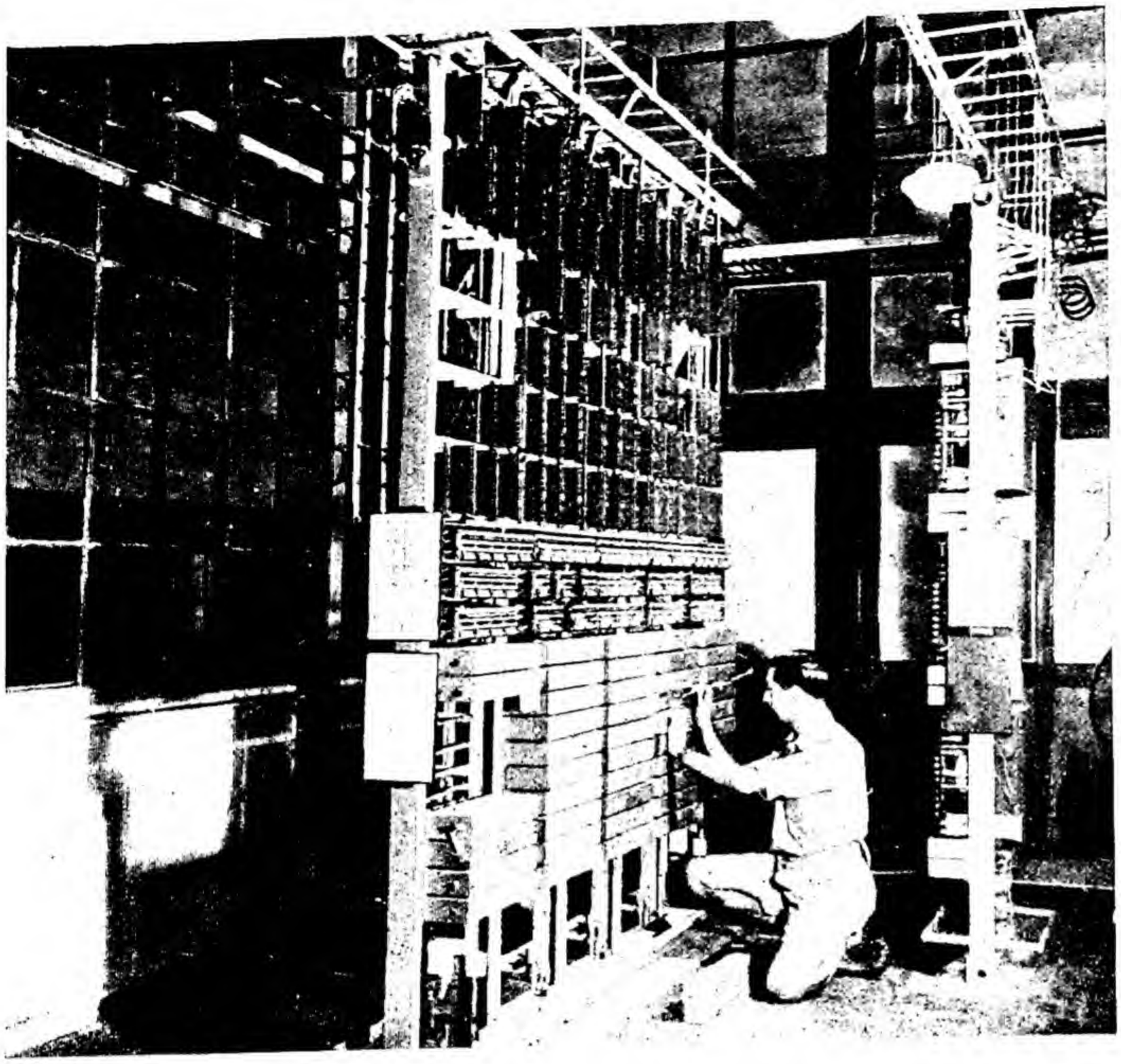




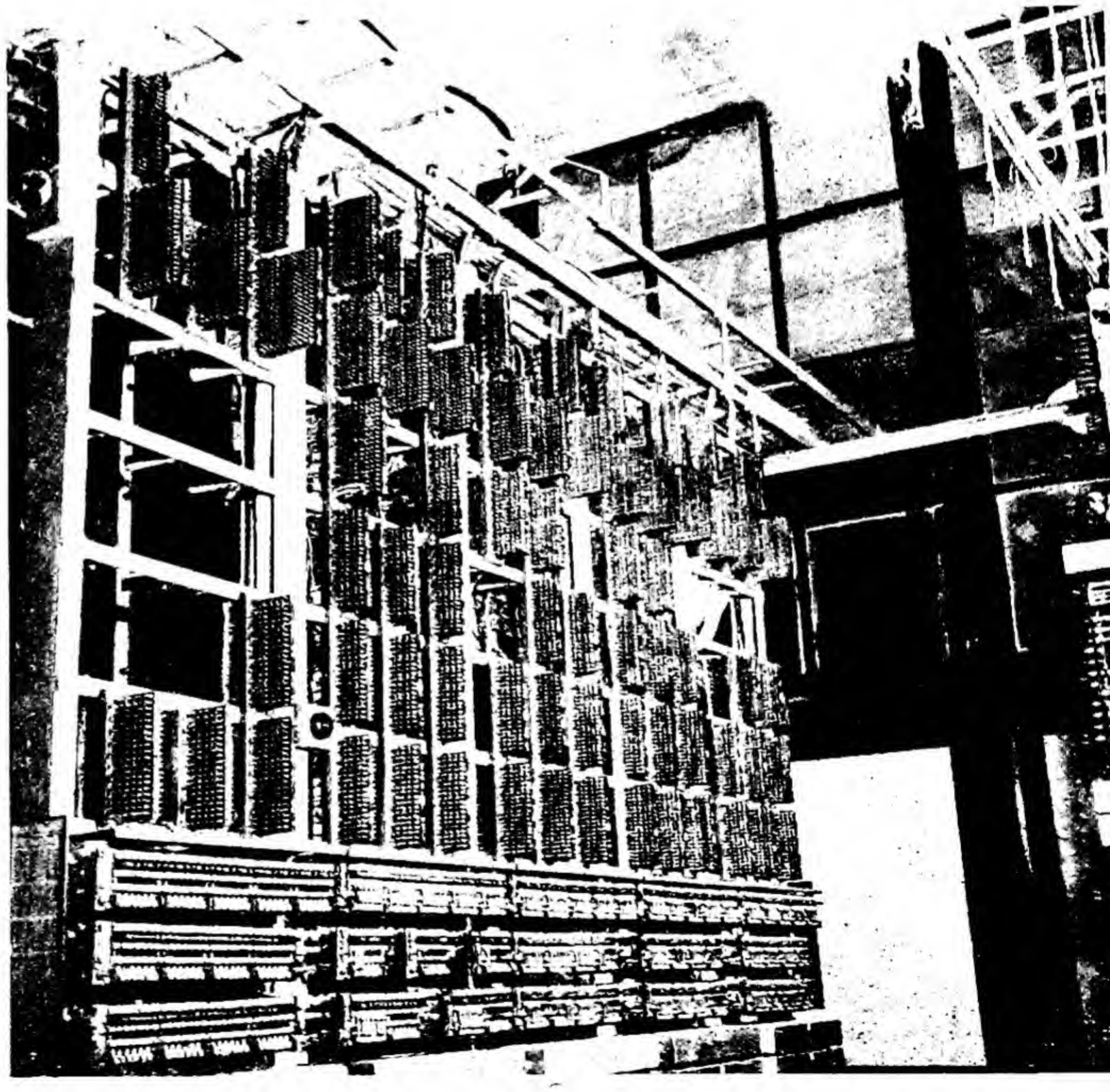
Power supplies in a small Carrier Repeater Station



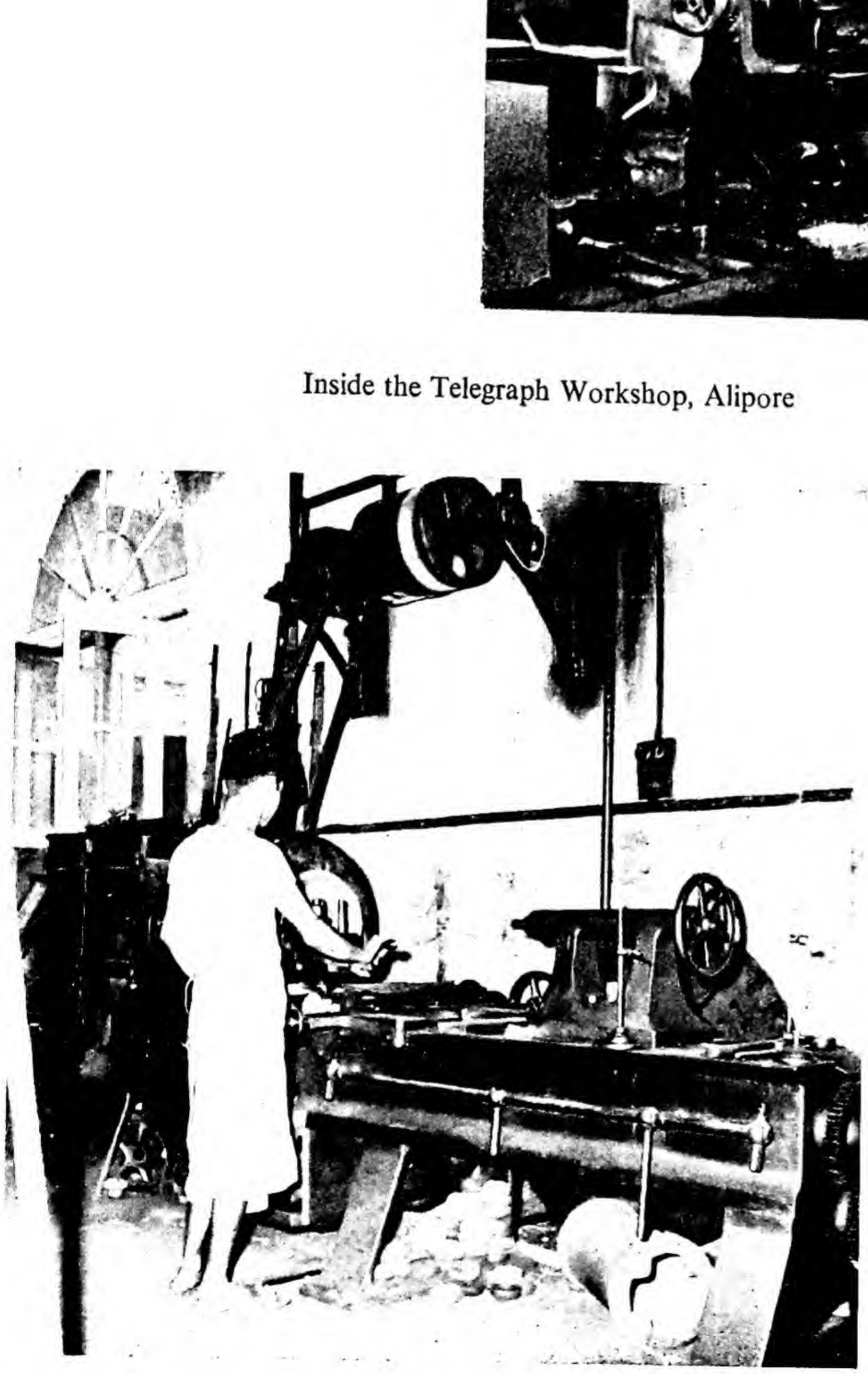
Trunk line commutator



Trunk line relay racks



Inside the Telegraph Workshop, Alipore



Inside the Telegraph Workshop, Alipore.

Operators at work in a large Trunk Exchange.

fantastic aggregate of lost time. But exactly at 6 P.M. on that day, Shri Jagjivan Ram, Union Minister for Communications, in the presence of his Deputy Minister, Shri Raj Bahadur, twirled the dial for the first time in Calcutta to talk to Shri B. C. Roy, Bengal Chief Minister.

The exchange was formerly known as 'Central'. On May 30, 1953, they were renamed, economically, as '24'. Citizens of Delhi and Bombay, who have long enjoyed the luxury of the automatic telephones, may consider Calcutta-wallahs to be country bumpkins because their new telephone directories have to contain vigorous phone and line drawings to illustrate the do's and don'ts of automatic dialling; even a documentary film had to be shown to educate them in the art of twirling dials. Two more exchanges were opened two months later, but the last may have to wait until 1957.

Shri B. C. Roy, West Bengal's Chief Minister, said he had used the Calcutta 'Hello, Central?' phone for 42 years, and he calculated that as much as a whole year of his life might, in the aggregate, have been spent by him in trying to get connections. Both Shri Jagjivan Ram and Shri B. C. Roy agreed that the previous system was 'most unsatisfactory'. The Automatic System would save years for the citizens of Calcutta to be used for more creative work than waiting for connections.

MOUNT ROAD, MADRAS

The Madras Telephone System is about 70 years old. It started with 24 subscribers in 1882 and now there are over 5,600 exchange lines serving over 10,000 customers.

In 1910 the number of subscribers in Madras was about 250 and Magneto equipment was in use. By 1923 when the system was taken over by the Madras Telephone Company, the exchange had a total of 1,224 lines, 686 extensions and 10 private lines. It was a Joint Stock Company and it took over from the Oriental Telephone and Electric Company, which had made the real beginnings in Madras.

In 1925 a modern building, called 'Telephone House', situated in a central place was built by the Madras Telephone Company, and automatic equipment replaced the magneto one. The economic depression of 1931-32 affected the Madras Telephone System also considerably but after 1932 there was a trend toward expansion, slow but steady. The 1,500 lines of 1927 increased to 3,300 in 1943. Automatic system was put into service in the new building

on 1st April 1926. With the change-over to the Automatic System, a scheme of laying underground cable was put into motion. The programme was of considerable magnitude and when it was completed, 90 per cent. of the subscribers who were till then served by overhead lines, were linked to the exchange by the underground cables. The automatic equipment and the large network of underground cables enabled the Company to cope up with the growing number of subscribers. The Mount Road Exchange was opened in 1930 with 100 lines. Another satellite exchange was opened at Mambalam in 1936 with 200 lines.

In 1941 the Government offered to purchase the Madras Telephone Company, but according to the terms of the licence, they had to secure the consent of 75 per cent. of the subscribers, which was not forthcoming. Eventually the transfer took place in April, 1943. The Government Telephone Board constituted for effecting the transfer of all these Companies had managed to purchase all the shares of the Madras Telephone Company.

In 1944 a small satellite exchange of 100 lines was opened at St. Thomas Mount and 300 lines were added to the Mount Road Exchange. After World War II there was tremendous expansion as the public clamoured for more telephones. By 1947 the Mount Road Exchange was extended by 1,500 lines at a cost of Rs 478,000.

By 1950-51 there were 2,456 miles of telephone lines and 35,349 miles of cables in the Madras Telephone District. Proposals for future expansion have already been formulated, and orders placed for equipment; the first item of expansion of about 3,000 lines may be completed within a couple of years.

THE SUMMER CAPITAL

The Simla Magneto-Telephone System, one of the oldest departmental systems, began to expand during these years. Simla had become the summer Capital in place of Ootacamund. Lady operators employed on this exchange were highly praised.

The next notable step was the automatisation of the Simla Telephone Exchange. The Magneto-system then existing at Simla had 350 connections. The Simla System was expanding rapidly and the automatisation of the exchange was started in September, 1913, and completed on March 1914. Thus it was the first Auto System in India. The Automatic Exchange was

cut over, with 400 working connections and a reserve for another 300. The battery consisted of 48 Tudor J 4 cells mounted in two sections of 24 cells and of 218 ampere hour capacity. Ringing arrangement was of the ancient Harmonic type. The apparatus approximately cost the Department Rs 80,500.

Within a period of another three years, Simla was clamouring for more connections. The Government was expanding on account of the war; and there were social-hanger-ons. Another 200 lines extension of 'the auto' was ordered. Meanwhile a C.B. Board was fitted to cope with the increasing traffic. Auto subscribers used to dial '0' and were connected to the Manual Board Operator by the Trunk Operator. The extension of auto system by another 200 lines took place in 1917. Even this was not sufficient. By 1918 the opening of the former C.B. Board was resumed to cope with the increasing demand. The method of 'trunking' was as before.

The Automatic Exchange at Simla was shifted into a new building by the departmental staff. The work had to be completed in record time as the building was not handed over till 15th December 1920, while the exchange had to be functioning by the middle of March, 1921. The building was damp and a certain amount of trouble was experienced from low insulation. The new exchange, notwithstanding such difficulties, began functioning from 20th February, 1921 at 10 P.M., a feather in the departmental turban.

DELHI DIALLING

The first regular telephone in Delhi was installed during the 'Durbar' of 1911. Delhi was a small place in those days compared to its present size; the hub of the Republic it was still to become. Even then the demand was there and the system was being continuously expanded and there were at the end of the second decade of the century around 800 telephones working on the Manual System. By that time it had been decided to move the 'Imperial Capital' from Calcutta, the birthplace of the 'Indian Empire', to the historic capital of India and accordingly it was decided to expand the system further and replace it by automatic equipment.

The conversion of the Delhi Telephone System from the Manual to the Automatic was completed during 1926. There were now in Delhi three Automatic Exchanges. One was at the Secretariat equipped for 2,000 lines; the second with 1,500 lines was at Lothian Road; and the third, a relay

Automatic Board of 300 lines, at Delhi Cantonment. In addition, a Trunk Exchange of the Cordless type was installed in New Delhi. The Delhi System became completely automatic with inter-dialling facilities for all subscribers within the area.

By this time, the Delhi Telephone System had grown considerably. The Connaught Place Telephone Exchange with the initial 700 lines installed in 1935 expanded rapidly. 500 lines were added next year, and the type of equipment used throughout was G.E.C.'s 2000-type. 1937-38 saw the addition of 800 lines, and further 500 lines were added to the existing 2,000 lines of Connaught Place Exchange during 1944-45. A bulk expansion took place during 1947-48 of about 4,000 lines. In 1951 the capacity was raised to 7,000 lines making it the largest exchange in the Capital.

To meet the increasing needs of the city, a 600-line C.B. Multiple Board was installed at the Lothian Exchange in 1946 to be operated in conjunction with the Automatic Exchange. A 200-line extension of the Auto Equipment was secured during the same year. In 1949-50, 300 lines of Auto Equipment were added, thereby raising its capacity to 2,600 lines (2,000 Auto plus 600 Manual). The replacement of the Lothian Exchange, which has been in service for over 27 years, by a 4,000-line Exchange was completed during this year.

The 2,000-line Exchange at the Secretariat was dismantled early in 1949 and all its connections were transferred to Connaught Place Exchange. The Manual Exchange at Avenue, opened in 1941-42, was meant primarily to cater to the requirements of the Defence Force. It has a capacity for 960 lines.

The 300-line Relay Automatic Telephone Equipment installed at Cantonment in 1925 was replaced by a 200-line C.B. Board in 1936-37. This was again converted to Auto in 1950-51 when a 500-line Discriminating Satellite, parented on to Connaught Place Exchange, was opened.

Even with all this increase it has not been possible to catch up with the demands of this sprawling city with an octopus Secretariat. Plans are in hand for the installation of a 2,000-line exchange in the Secretariat and a 2,500-line exchange in the suburbs by the end of 1954-55 and to double the capacity of the new 4,000-line exchange in old Delhi.

X. Post-War Plans

'FASTEST WITH the mostest' was the war cry. Speed, and greater speed, spelt victory. India's telephone network was no match for the sudden important role the country had to play as a strategic centre. The urgencies of the war gave the telephone system a unique opportunity. Financial grants became less stingy. Projects became more daring.

From 1st January 1940, 'Urgent Private Inland Trunk Calls' were introduced and they were charged at double the corresponding rate for ordinary calls. A class system in calls was introduced because war-work had to be done in a hurry. The Overseas Telephone Service was temporarily suspended during the hostilities.

During the war years of 1940-46, vast expansion took place in the telephone system of India. To provide improved communication facilities to the administrative and fighting services, the Government of India constituted in 1942 the Telecommunication Development Board whose main function was to co-ordinate the requirements of different fighting services and of the Telegraph Department and to draw up schemes for the expansion of the telephone networks of the country. A scheme costing over Rs 16 crores was drawn up and work was started almost immediately.

The C-8 type of construction works were taken up during this time which made it possible to run a number of speech and telegraph channels on a limited number of physical pairs. The development of this scheme also made trunk-working possible between many of the far-flung stations within India. Installation of by-pass filters on pairs was freely used in order to open as many public call offices as possible. By the end of March, 1946, 8,405 miles of C-8 line and 114,184 miles of wire were erected. Maintenance Order Wire Circuits, intended to facilitate proper control of line staff and

thereby improve the maintenance of the C-8 lines, were built. About 7,259 miles of wire were erected in this connection. Posts and Telegraphs erected for the Railways 16,539 miles of wire.

These war years saw the installation of type T-43 Trunk Exchanges the design of which was in many ways completely different from the older type of Trunk Exchanges (T. 32), in about 110 places. Defence Trunk Exchange of a similar design in about 76 stations and Combined Defence and Post and Telegraph Civil Trunk Exchanges were installed in 45 places. The Carrier network expanded rapidly and by 31st March 1946 about 80 three-channel telephone systems were completed and work of installation on 14 was in progress. Voice Frequency Telegraph systems expanded to about 45.

A 12-channel carrier system was installed between Calcutta and Patna to cope with the increasing demand of trunk traffic. The system was started on 16th June 1951. The installation of such systems between Calcutta-Delhi, Delhi-Amritsar, Bombay-Ahmedabad, and Bombay-Poona, where there has always been heavy traffic congestion, are in the offing.

'OWN YOUR TELEPHONE'

The 'Own Your Telephone' Scheme was inaugurated in December 1949. The Indian public was clamouring for more telephones, but due to financial stringency, the Department was unable to go ahead with its schemes. A way out was devised under the guidance of Shri Rafi Ahmed Kidwai, then Communications Minister, by the introduction of a scheme whereby a subscriber was required to pay Rs 2,500 in Bombay and Calcutta and Rs 2,000 in Kanpur, New Delhi, Madras and Ahmedabad as a deposit which entitled him to a telephone connection for twenty years. A nominal maintenance charge of Rs 2 per month and the call charges were his only additional liabilities.

By July 31, 1952, the 'Own Your Telephone' collected Rs 30,985,500. 13,310 applicants were satisfied. Previously they had no chance as Government was short of cash to import new equipment. Their business suffered. The initial investment. therefore, was taken with good grace. Five million rupees out of the earnings of the 'Own Your Telephone' Scheme were expended in 1950 for telephone expansion.

Two other schemes were inaugurated. One was 'Own Your Own Telephone Exchange' Scheme whereby any place, mohalla, or mandi, or a small town could have its exchange (50 lines) if at least 25 prospective sub-

scribers were willing to pay Rs 2,000 each. The conditions attached to this scheme were the same as under 'Own Your Telephone' Scheme. The other one was the 'Telephone Loan Scheme' whereby bodies like Chamber of Commerce advanced a lump sum of at least Rs 50,000 to the Government for 20 years at 2¾ per cent. interest, the Department taking the responsibility of providing them with a small Telephone Exchange.

STATES' LINES TAKEN

With the dawn of independence on August 15, 1947 and according to the implementation of the Federal Financial Integration Scheme of April 1, 1950, the administration of the entire network of Telegraph and Telephone systems of the nation, including those that previously existed in the ex-Princely States, became a major adventure.

As many as 196 Telephone Exchanges of varying capacities and many designs and situated in different parts of the numerous ex-Princely States scattered all over the country, which merged into Part A States or were constituted into Part B or Part C States, were taken over so that these systems which were working with different degrees of efficiency and consisted of technical equipments of miscellaneous types and manufacture could fit into and function along with the general telecommunication network of the country. The installed capacity of these 196 exchanges was 13,362 lines with 11,296 working connections. Each of these exchanges had its own level of efficiency and adopted its own technique of maintenance and prescribed varying tariff rates fixed arbitrarily. Soon after taking them over, measures were adopted to improve their technical efficiency by replacement of obsolete and unserviceable equipments and also by lending well-qualified and experienced staff. Simultaneously, action was initiated to bring isolated exchanges on to the general network of the nation by construction of new circuits and lines so that certain isolated segments of the public could enjoy facilities of telephone communication with all corners of the country.

The integration of the Telegraph and Telephone network which commenced with the taking over of the Baroda Telephone System on May 1, 1949, was completed with the taking over of the Telephone network in PEPSU on April 13, 1950. The more complicated task of acquisition of the staff and their final absorption into the different cadres of service in Posts and Telegraphs was tackled.

After taking over the ex-Princely States Telephone Systems, the question of nationalising the privately-owned Telephone Systems in some of these States was tackled. All this took only two years.

NO COMPARISONS, PLEASE!

On 31st March 1951, there were 540 departmental exchanges with 102,156 direct lines and 18,092 extensions. In addition, there were 33,908 connections from 3,033 private branch exchanges linked by junction lines. There were also 117 private exchanges with 2,875 telephones and 1,122 non-exchange systems with 8,779 telephones. There was one licensed Telephone Company operating in the Bihar Circle with 10 exchanges and 1,838 telephones. There were also 167 small licensed systems with 2,748 telephones. The total revenue due to telephone rentals, call fees, trunk call fees, recovery from guarantors and royalties from Companies amounted to Rs 88,958,000. The total number of trunk calls was 7,135,434.

The telecommunication development of a country is best judged by the number of its telephones. On the 1st January, 1951, there were approximately 74·8 million telephones in the entire world. Out of these, India had only about 160,000. As her population is about one-fifth of the population of the world, the number of telephones should proportionately have been about 15 million. Ten countries, *viz.*, United States, United Kingdom, Canada, Germany, France, Japan, Sweden, U.S.S.R., Italy and Australia, have more than one million telephones each and there are six countries which have more than 15 telephones for every 100 of their populations. The statement given below shows that the number of telephone per 100 heads is less in India than even in Malaya and Jordan:—

	No. of telephones on 1st January 1951	Telephones per 100 population
Argentina	798,391	4·6
Australia	1,158,202	13·9
Ceylon	16,800	0·2
Cuba	120,668	2·2
Egypt	115,500	0·5
India	168,300	0·05

	No. of telephones on 1st January 1951	Telephones per 100 population
Ireland	82,031	2·7
Iran	28,620	0·2
Jordan	2,245	0·3
Lebanon	13,500	1·1
Malaya	23,694	0·4
Sweden	1,685,200	23·9
Tunisia	25,207	0·8
Turkey	65,150	0·3
United States	43,000,000	28·1

In Australia, there are two cities, Melbourne and Sydney, each of which has more telephones than the whole of India. These cities are smaller than Bombay and Calcutta. The following statement shows how poor even our large cities are as compared to certain cities in other countries.

	Population in thousands	Number of telephones on 1st January 1951	Telephones per 100 population
Bombay	3,700	44,550	1·2
Calcutta	5,700	33,829	0·5
New Delhi	1,194	11,844	1·0
Buenos Aires	4,955	502,251	10·1
Melbourne	1,328	284,801	18·7
Sydney	1,591	187,123	18·0
London	8,417	1,632,900	19·4
Paris	2,795	635,714	22·7
Honolulu	230	78,654	34·2
Stockholm	746	356,999	47·9
New York	7,927	3,137,405	39·6
Washington DC	805	487,472	60·6
Cape Town	530	60,068	11·3

The picture improved very slightly by 1952 so far as the telephones were concerned, although there was rapid progress in other directions. The Big-City Picture on March 31, 1952 looked:

Bombay	46,181
Calcutta	35,794
Delhi	14,582
Madras	11,102
Ahmedabad	3,782
Hyderabad	2,376
Bangalore	2,333
Lucknow	2,327
Kanpur	2,285
Nagpur	1,116

India's poor showing in the field of telephones has never been adequately explained. At present there is no doubt that the demand is greater than supply; the Posts and Telegraphs has not been given enough funds to execute the desired expansion. For a long time, to begin with, trade and commerce was dominated by a handful of Britishers who were not interested in villages. The public demand is indeed greater than the supply, but it is not great enough. Otherwise, the pressure of public opinion would secure for the telephones a higher priority.

The point can be made more tellingly by having comparative figures of telephones per 100 literate persons. In other words, the staggering illiteracy is the great drag on India's telephonic progress. The Government is not as generous in allotting money to the telephones as it is to the posts, and yet it is the earnings of the telephones that make up for the loss of the posts.

In order to prevent theft of copper wire, a special pre-occupation of petty thieves in India, Parliament passed an Act in 1950, declaring the possession of 150 lbs, 200 lbs, and 300 lbs per mile gauges of copper wire 'unlawful and punishable with imprisonment for a term which may extend to five years or with fine, or both'. The Act came into force from October 1951.

WHY?

In connection with the Posts and Telegraphs Department's criticism of other branches of the Government who economise, erroneously, through the reduction of telephone connections, at least one reason as to the great Telephone

Lag was indicated. Moreover, until recently, man was the cheapest commodity in India. For instance, hiring twenty 'coolies' to transport your furniture cost you less than calling a truck. By and large people do not mind delays, because time is another cheap commodity in India. In other words, the general public does not feel the necessity. Telephone is in tune with a community where overheads are high and where people want to pack two days' work in one.

If we are in search for superlatives, India can boast the smallest number of telephones of any civilised country. Another reason comes to mind. India is mostly rural and a majority of her population lives in villages. The telephone, on the other hand, is an urban attribute. It is the flowering of a crowded city and a crowded life. Perhaps most Indians are happier without the disturbing tinklers.

Till the independence there had always been a brake, however unconscious, on any development which would have been detrimental to overseas producers, specially of highly technical equipment like automatic telephones. It is only after throwing away the shackles of the British Raj that India has been able to go ahead with schemes of manufacturing technical goods, like automobiles, etc. The telephone industry has been no exception.

Six miles from Bangalore, at Duravani Nagar, the Indian Telephone Industries' Factory went to work. By 1952, it was able to design and develop the 'Single Channel Carrier Systems'. Used between trunk centres to increase the number of telephone circuits in between, the carrier system was previously being imported from abroad. Now the country is expecting 30 such systems from India's own Telephone Factory. It is calculated that in a few years the Factory will be able fully to meet India's needs of carrier systems. The development of a three-channel carrier telephone system is in an advanced stage. According to the Factory Management, they 'have plans to export telephones to neighbouring countries after meeting the home requirements'.

The Factory at present produces 40,000 telephones annually which would be stepped up to 60,000 next year. Except for the condenser and dial all other parts of the telephone are manufactured in the Factory itself. Since 1948, when it was started, the Factory has manufactured 76,798 telephones. A model township housing 2,000 workers is planned. It is expected that within a couple of years the Factory will be producing all the Automatic Exchange Equipment for meeting the needs of the country.

Plans for the coming three years, the remainder part of the Five-Year Plan, envisage 'a Telephone Exchange at every district headquarters and a Public Call Office at every thana headquarters'. Every township with over 30,000 population is to have an Exchange. The difficulty about the equipment is greater than the one about funds, and so efforts are afoot to open a factory for manufacturing cables near Chittaranjan.

Direct link with various European countries by radio telegraph and telephones, such as the recent one between London-Calcutta, and Bombay-Tokyo is another aim. The very backwardness of telephone communication in India opens up vast vistas, and the Department looks ahead.

XI. On The Beam

EVER SINCE Maxwell first published his electromagnetic theory of light in 1865, the possibility of generating other electromagnetic waves, differing from light waves only in length, was inferred. Wireless telegraphy, the science of the electric transmission of intelligence couched in telegraphic code across space without the use of connecting wires, owes its origin to that basic assumption. The old Vedic theory of *Shabda-Brahma,* or the Word Eternal, must have been born of an early human hunch that what was once spoken had a universal range, far beyond the ear of the next hearer.

Guglielmo Marconi invented the antenna in 1896 as a practical device of sound transmission. In his first successful experiments a single vertical wire broken by a spark gap was used, the lower end being grounded and the upper elevated in the air. He found that the higher his antenna, the greater the effective communicating range of his transmitter. In 1899 he was able to establish wireless communication between two British cruisers. The great Indian Scientist, Sir J. C. Bose, also experimented with wireless transmission at the same time as Marcony, but never patented his invention as his mind was set on the pure realities of research, specially on plant life.

At the dawn of the twentieth century, Wireless Telegraphy, substantially developed by Marconi, came into vogue all over the world. Wireless insured shorter time and longer distance, and as its name implied, independence of the wire, thus resulting in reducing immensely the cost, specially where long distances were involved. But its greater dependence on elements and atmosphere, with consequent fade-outs, made it less reliable and controlled by man, and so it could not entirely replace telegraphy and telephony.

OPENING THE ANDAMANS

India was not lagging behind. The Saugar Islands and the Sandheads, in Diamond Harbour near Calcutta, were connected with wireless communication in 1902, the first use of wireless in India. The wireless telegraph signals were subject to interference during thunder storms, and yet the result was encouraging enough to give a green light.

Elephant Point and Amherst near Bombay, across the sub-continent from Diamond Harbour, were next on the list. The 85-mile distance began to be conquered in February, 1903. In April, 1904, there was a successful connection. The engineers took another leap, this time towards the Andaman Islands. A wireless telegraph communication was established between Diamond Island and Port Blair in October, 1904. It was this connection that opened up the Andamans for colonisation and for 'deportation for life' of famous patriots like Lokmanya Tilak and Barin Ghosh. It took two months to erect the 150-foot masts and to instal oil engines and dynamos at Diamond Island, Slipper Island and Port Blair, a distance of 300 miles; communication was established on 10th February, 1905 for the first time.

IN AFRIDI-LAND

For various reasons, not the last among them the natural desire to defeat the Afridi's insatiable appetite for cutting telegraph wires, it was found that wireless communications would be a great help in the North Western Frontier. Peshawar and Landikotal were accordingly interconnected. The system, father of the later military walkie-talkie, was successful and demonstrated 'the possibility of communicating by Wireless Telegraphy through intervening ranges of mountains running up to 6,700 feet above sea level and between places situated at widely different relative elevations'. Actually the distance between Peshawar and Landikotal was not more than 22 miles. The Amir of Afghanistan paid a visit to the stations and His Majesty evinced keen interest in their working and personally sent and received several wireless messages.

In April, 1907 the experiment of operating Wireless Telegraphy direct from Calcutta to the Diamond Harbour Steam Vessel 'Fraser', anchored at the Sandheads, was tried. It was successful. In consequence, the wireless telegraph office at Saugar Island was retrenched. Due to the failure of

Diamond Island cable in the month of May of the same year, a temporary wireless office was opened at Bassein for the purpose of communicating with Diamond Islands. This office was able to contact Port Blair directly at night during the cold weather and was consequently given a lease of life.

AT SEA, AND IN THE AIR

A radio-telegraph station was opened in 1909 to exchange messages with those ships at sea which were equipped with radio telegraphy apparatus. Not only it was successful; it ushered in a new era in Indian shipping. Steamers were no more isolated islands floating in the blue. They were linked with the shore every minute, from there to receive emergency aid in cases of illness and shipwrecks.

Consequently, a chain of such stations was opened at Calcutta, Diamond Island, Table Islands and Victoria Point, and these were thrown open for international traffic with ships at sea on November 1, 1910. A contract with Marconi Company was placed in 1911 for three stations with a range of 600 miles each at Calcutta, Allahabad and Delhi, and one Station at Simla with a range of 300 miles. Another item from the old records reveals a 'curious' experience because stations supposed to have short ranges began to receive messages from long distances:

> " During the cold weather season and at night, communication was effected over very long distances with the existing small power stations. The stations at Calcutta and Bombay were able to converse with each other on two or three occasions. At Calcutta the signals from the German Cruiser ' Gneisnau ' on her voyage from Colombo to Bombay were heard every night, and very frequently signals were heard from vessels voyaging between Colombo and Singapore. At the Sandheads it was reported that signals were received from Jask. The stations at Bassein and Diamond Island have at times read the signals from Bombay, while the latter station has sometimes heard the signals from His Majesty's ships in the neighbourhood of Hongkong."

Up to the end of 1918-19 the Coast Wireless Stations were controlled by the Navy and Inland Stations by the Army. Most of them were later

taken over by the Telegraph Department. Those which were in a bad state had to be renovated, as most of the apparatus in them were out of date.

Facilities were offered by coastal stations whereby ships at Sea equipped with direction finding installations could obtain bearings on the coast stations as an aid to navigation. Bearings thus obtained on Diamond Island in unfavourable weather had been particularly valuable. Landing was made safer for ships, as, later, for airplanes. In case a ship found its compass out of order, it could find direction through radioed instructions. It was like a second string to the bow. The new device also enabled the detection of clandestine wireless stations operating to give advance market rates.

The wireless facilities provided at Karachi in connection with the Air Mail Service to and from Europe *via* Iraq and Egypt worked to the schedule. In addition to long-wave communication with aeroplanes in flight, short-wave communications for air service and meteorological purposes were maintained with Baghdad, Aden and other places. In December 1928, the wireless stations at Karachi and Delhi commenced regular work in connection with the Indian State Air Service connecting those places. The stations at Victoria Point, Rangoon, Diamond Island and Calcutta provided wireless facilities for flying boats of the Royal Air Force from Singapore, when engaged in flights for survey purposes. By special arrangement the aeroplane 'South Cross' communicated with several wireless stations while flying across India from Australia to England in June and July 1929.

EARLIEST IN THE WORLD

India entered the field of wireless very early; in fact the stations in Burma and the Andaman Islands which were erected in 1904-5 were among the earliest in the world for maintaining communication between fixed points on land. Coast stations for communicating with ships were built a few years later at the principal ports, and these were followed by a chain of island stations linking up the most important towns.

A new wireless route between Madras and Port Blair was opened on 1st October, 1920; this replaced the old Calcutta-Rangoon circuit. The traffic between India on one hand and Port Blair and Victoria Point on the other was now routed *via* Madras instead of Rangoon.

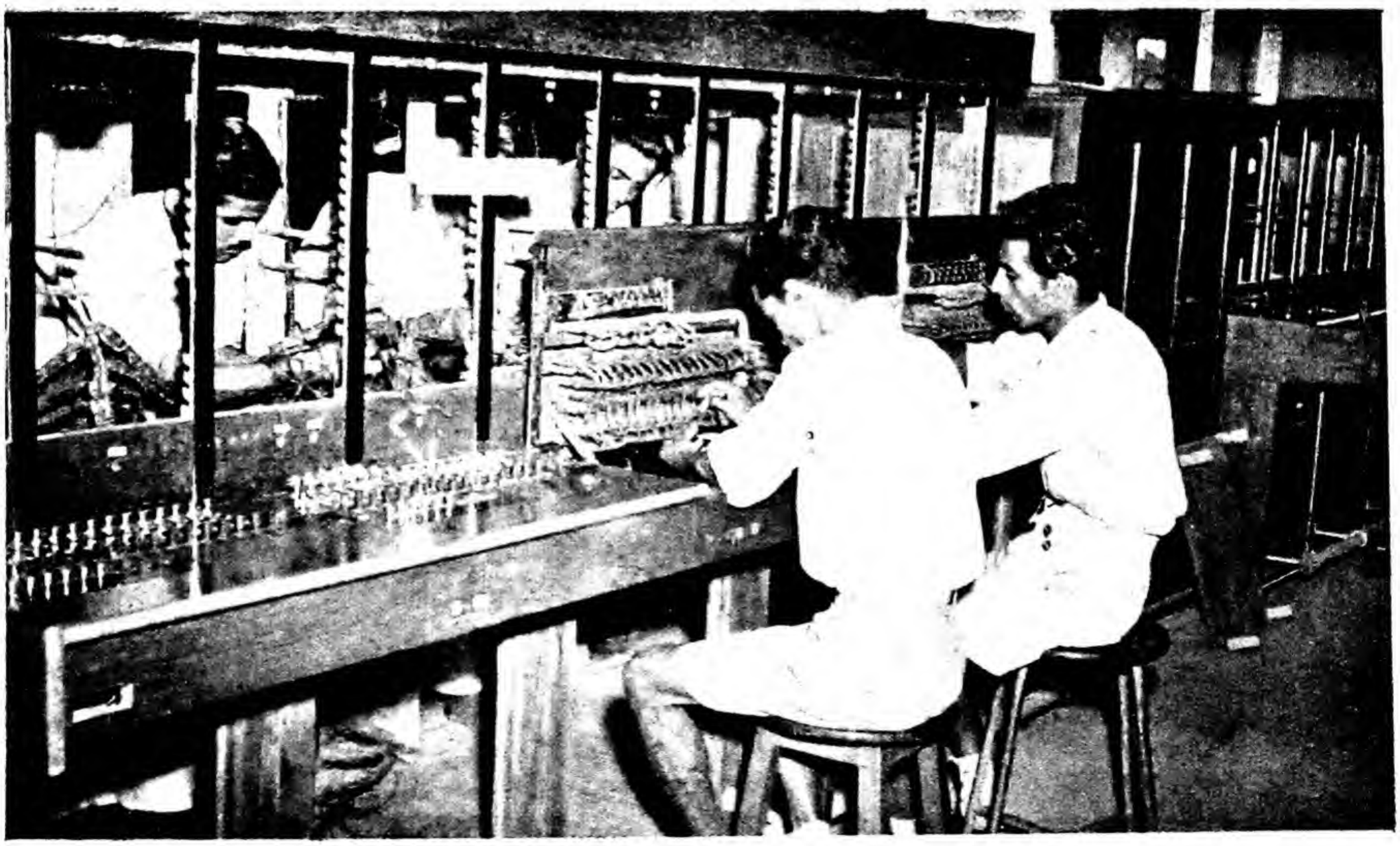
Occasional traffic between Bombay, Madras and Colombo was carried out by the Wireless Stations when the land and cable routes were paralysed.

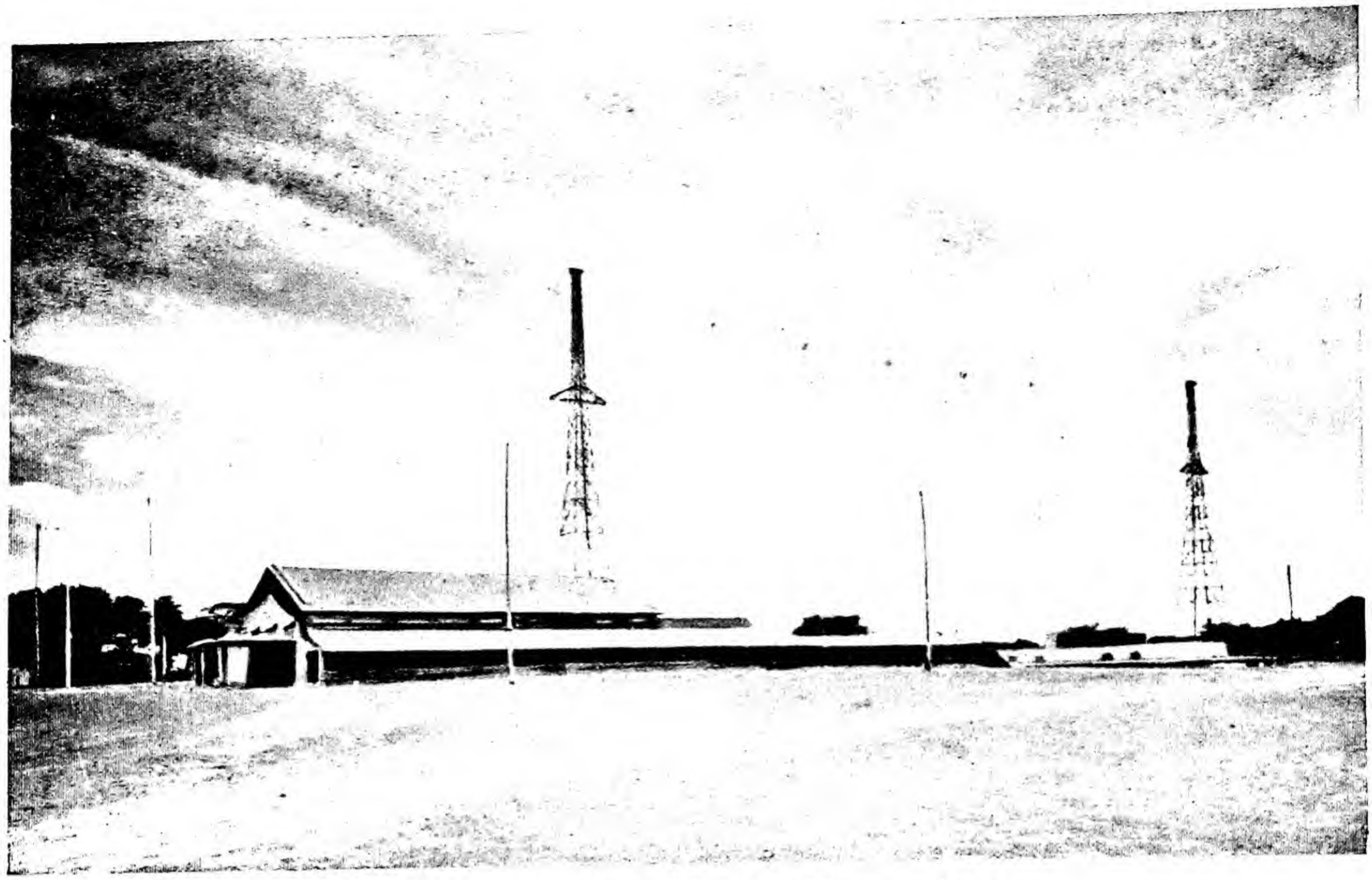
Telegraph Workshops Bombay. Assembly of Pedestal Sets.

Cord winding. Plugs being fitted to cords.

Central Battery Exchange switch board under manufacture at Bombay Workshop.
Relays being mounted on relay plate.

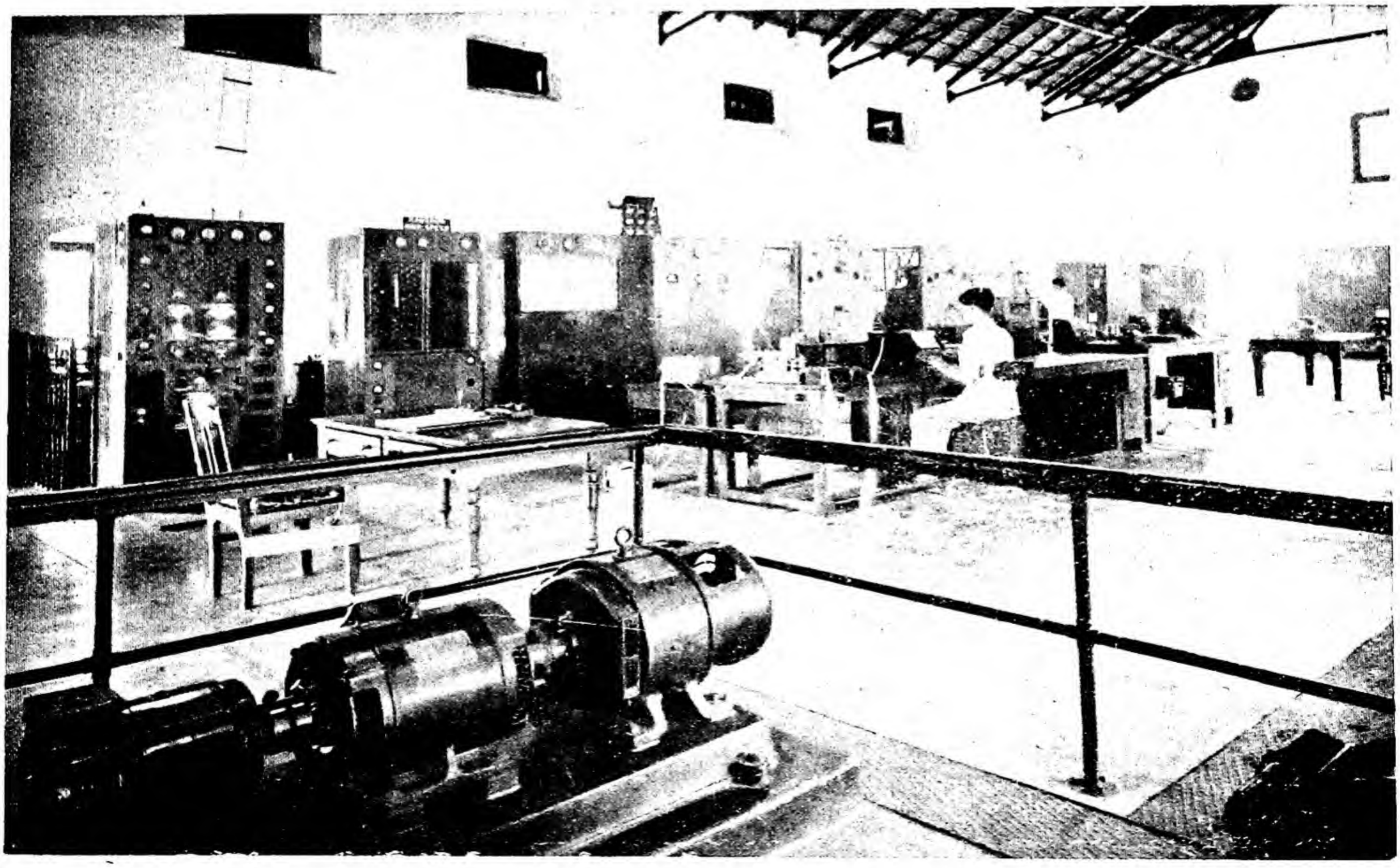
Switchboard being assembled.

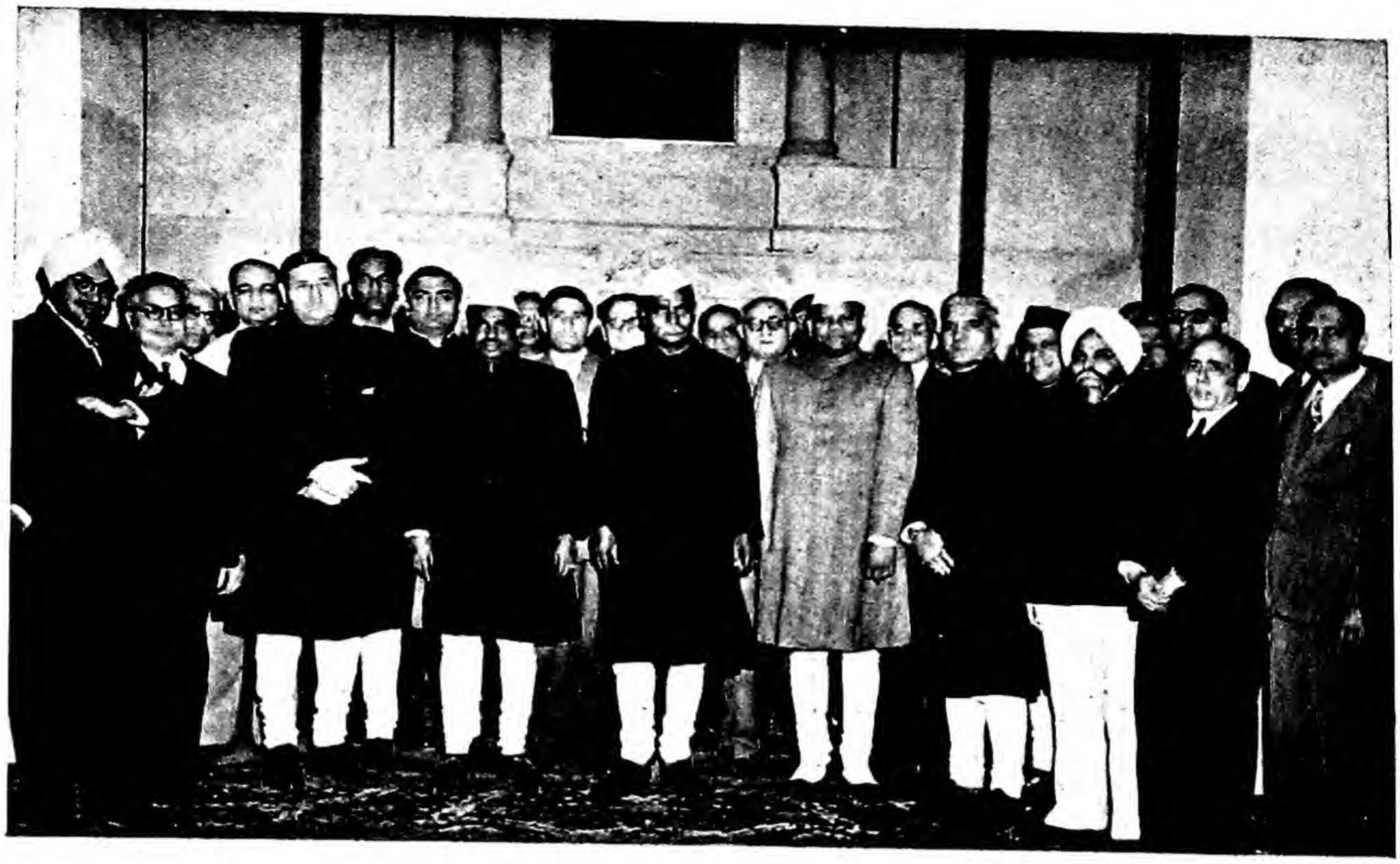




Buildings and Aerials at Madras Wireless Station.

Inside a Wireless Station.





Postmasters General Conference held on 12th March 53.
President of India & Minister for Communications in the centre.

Champion Athletes of the Posts & Telegraphs 1953.

Naval Traffic was exchanged between Bombay and Aden. Wireless became a standby. The number of radio-telegrams exchanged with ships at sea in 1920 was 19,356.

A foreign radio service between Burma and the Malaya Peninsula was opened on 15th June. 1922. *via* Rangoon, Victoria Point and Penang. Continuous reception from Penang was not possible until a more modern transmitting gear was installed there. In the meantime, matters were improved by the fitting of valve amplifiers at Rangoon and a moderate amount of traffic was exchanged regularly. The charge for telegrams from Burma was 15 annas per word.

During the war years, a lot of expansion took place in Wireless Telegraphy Communication with the foreign countries. On 14th January, 1942, Bombay-Australia Wireless Telegraph Service with Melbourne and Sydney was put through. Next month, on 25th February, Bombay-China Wireless Service was inaugurated. Bombay-New York Wireless Telegraph Service was put across on 15th August, 1944. On the 29th of the same month, a second civilian outlet to the United Kingdom *via* Delhi and London Wireless Telegraph Service was inaugurated. All these services were handled by the present Indian Overseas Communication Services. The Army, and British businessmen, were the chief patrons.

A Radio Telephone Service between India and Nepal was inaugurated in January 1950. This channel was provided by the installation of wireless equipment at Patna and Khatmandu, the calls being extended over the land lines on trunks to any part of the country. The new facility came in handy during the crisis precipitated by King Tribhuvan's flight to Delhi in an Indian Army Dakota. The Indian Ambassador in Nepal could keep in touch with Prime Minister Nehru and receive instructions.

XII. Riding The Waves

THE WIRELESS telegraph traffic during 1907, five years after one island beamed another for the first time in India, amounted to 17,069 telegrams containing 4,70,037 words. Calcutta, Mergui and Victoria Point were selected as sites for wireless stations, and the work of installation was in progress by the end of the year. The stations opened at Mergui and Victoria Point gave a good account of themselves except at times of severe atmospheric disturbances. The total number of Radio telegraph stations at this time was only nine.

The total number of inland messages cleared by all the radio-telegraph offices between 1908—11 was 52,619, 47,421 and 54,123 respectively.

THE MONSOON

The circuit to the Andamans experienced unprecedented interference from atmospheric disturbances between April and June, 1910. The monsoon was changing from the North-East to the South-West. The monsoon is an Indian phenomenon, a South-East Asian phenomenon, and the problems created by it are naturally endemic to the area of its pervasion. The thundering, torrential, throbbing and wild nature of India's rainy season is governed by the monsoon. Depressions formed in the north Bay of Bengal give it its steaming birth. South-westerly-to-westerly monsoon air from the Indian Ocean across the equator extends northward in the Bay of Bengal and produces a depression. This course is influenced by the Arakan-Chittagong hills, Khasi hills and by the Eastern Himalayas, and also by the seasonal trough of low pressure. A rainbelt, usually observed in the south-west sector of the depression, develops only in the later stages after the cold fresh monsoon air current weakens and withdraws. No engineer

working for telecommunication in India could afford to remain unfamiliar with the vagaries and violence of the Indian monsoon.

WIRELESS IN THE WAR

The technical progress in Wireless Telegraphy continued. Modern receiving apparatus including valve amplifiers were installed at ten stations in India in 1920-21. A continuous-wave transmitting set was tested at Karachi and later erected at Jutogh for a try-out. It was found then that the 3-KW set was covering distances as great as those obtained with the old 5-KW 'SPARK' installation.

During the summer months of 1920, a semi-portable station of Army pattern was erected at Dusdap in East Persia in order to maintain communication with Quetta. A similar station was erected in March 1921 at Patna ranging to Allahabad and Calcutta.

Another innovation in January 1921 was the introduction of a small portable continuous-wave set of Army pattern, which accompanied the British Mission to Kabul, where it was erected by the Military Staff. All the traffic between this mission at Kabul and India was conducted over the system *via* Peshawar Radio.

Experiments were carried out at Karachi and in the neighbourhood of Simla and Lahore with portable Marconi Pack sets, employing thermionic valves for both telephony and telegraphy. The results were heartening.

At the beginning of the first World War, wireless stations were as efficient as the state of contemporary knowledge permitted. During the war, however, they suffered in maintenance in the same way as every other public utility. It was necessary to completely overhaul the system and introduce new techniques in accordance with the great advances made during the hostilities.

A scheme was drawn up and was approved in 1921. It provided for construction of a comprehensive network of wireless stations all over India. The programme had to be largely curtailed subsequently for financial reasons, but the scheme of general reorganisation was put into force.

A Director-in-Charge of Wireless, with several assistants, was added to the Posts and Telegraphs Directorate. He was made responsible for administration of stations in addition to advising on all questions of wireless policy and of drafting the necessary regulations. Another organisation was

also set up for the issue and control of licenses. Even though broadcasting had not yet started on a commercial scale, licenses for receivers on an extensive scale, and for the many Radio Clubs which were broadcasting on a limited basis, were being issued. The British system of state monopoly, in preference to the private enterprise prevailing in America, was still to come. Of course, the Radio Clubs received a share from the collected fees.

The Wireless Branch was reorganised on the Telegraph Engineering Branch model. Two Wireless Divisions were created; one was called the Wireless Experimental Division, and stationed at Alipore, and it undertook experimental repair, and testing work and control of stores. The second Division, called Wireless Engineering Division, which was to maintain the existing stations and to undertake the installation of new ones, had its headquarters at Delhi.

POST-WAR REPAIRS

During 1921, repairs and replacements of the existing stations took place. New generating sets and switch gears were installed at Karachi, Maymyo in Burma, and the old sets were removed to Lahore and Mingaladon respectively. New batteries were installed at Secunderabad, Port Blair and Calcutta. Those at Jutogh and Diamond Island was completely replaced and the Karachi and Rangoon ones extensively overhauled. Wireless plants at Allahabad, Mhow, Rangoon, Delhi and Karachi were improved and enlarged. A second 30-KW motor-alternator was installed at Madras. Sections of masts were renewed along with aerials at Karachi. Installation of a 6-KW continuous-wave set was carried out at the same station with experimental high speed transmission. The experimental establishment summed up its own record:

(a) High speed transmission and reception on the routes Mhow-Karachi and Karachi-Bombay was accomplished in 1921-22.

(b) Modified receiving circuit was designed and used successfully in conjunction with the Marconi undulator for automatic recording on a tape. Carnarvon was recorded in this manner using a 6 feet frame aerial.

(c) Some high frequency rejectors were obtained on loan from the Admiralty and fitted up for trial. At Bombay one was tried with a frame aerial. The G.P.O. type (high and low frequency) was tried out in connection with the G.P.O. set which was similar to those employed at Leafield and Cairo.

(d) Trials were carried out in reception from the new British Post Office station at Leafield (Oxford); various receivers were tested at Karachi, Delhi and other stations and 'good results obtained'.

(e) A start was made with Direction Finding work at Karachi for instructional and experimental purposes, and the establishment was also engaged on the atmospherics question, high speed working for small CW sets and distant control of inland stations.

In December 1921 two semi-portable sets (500 watts telegraph) were erected at Ajmer and two at Bikaner (Lalgarh) for the 'Prince's Camp'. These relieved the land-lines considerably. In January 1922, special arrangements were made for *R.I.M.S. Dufferin* to communicate with Calcutta, Rangoon and Madras when conveying His Royal Highness (Prince of Wales) to Burma and back. In February a temporary station (500 watts telegraph) was erected at Ahmedabad for the Bombay Government. It was dismantled in March, when no longer required. In September, a portable set (500 watts Pack telephone) accompanied the Commander-in-Chief to his shooting camp at Khanag (Kulu) and maintained communication with a cabinet set at Jutogh. This was a valuable test of these sets in a mountainous district, and added to the British pomp and circumstance.

A.I.R.'S AGENT

For the first time in India, race results were transmitted by Wireless from Poona to Bombay in August 1921, using two ½-KW Marconi Pack sets. Contact was maintained and messages were transmitted with *H.M.S. Renown*, which was in Red Sea, with the help of CW, 2-KW Valve Transmitter, situated at Mhow and Jutogh.

Wireless continued to intrigue people. A Radio Club was formed in Madras. Permission to broadcast, as an experimental measure, had been granted during 1923-24 to one club in Calcutta and one in Bombay. This permission was renewed, and it was extended to the Madras Presidency Radio Club. These were the collective father of the All-India Radio. And when private enterprise in broadcasting despaired, the Indian State Broadcasting Service under the supervision of the Posts and Telegraphs was organised in March 1929.

In all, at the end of 1939 there were 26 wireless stations in India of which twelve were for Aeronautical Wireless Service. One short wave

station dealt with Wireless Meteorological Service, while communications with ships at sea were maintained by five Coastal Wireless Stations. The rest were maintained for inland communication. The number of messages handled during the year by the departmental stations in India was over 7 lakhs.

Jutogh Radio continued to receive special messages from Oxford Radio either direct or *via* Cairo, addressed to certain newspapers and news agencies in India from their representatives in London. The British Official Press Communiques broadcast from Oxford Radio were also received and passed on to the Reuters, for distribution during the whole year, except during a few weeks in June and July when atmospheric conditions combined with the low power of Oxford Radio rendered reception unreliable.

On 6th June 1923, a special message announcing the results of the 'Derby' was also received in the same manner and forwarded to an addressee at Calcutta. All this led to a revolutionary transformation of the Indian press. The day's news could be covered before the day was over, even if it broke in distant London. Indian newspapers, moreover, could afford to receive many more words than previously; former telegraphic rates were prohibitive. Indian newspapers began to engage special representatives abroad instead of solely depending on news agencies.

REORGANISATION

The provisions of the Indian Wireless Telegraphy (Shipping) Act, 1920, having been incorporated in the Indian Merchant Shipping Act, 1923, came into force with effect from 5th May 1923, the former Act being repealed.

The India Radio Telegraph Company, a British outfit, entered into negotiations with Government for establishing wireless communication with England on the 'Beam System'. A license to establish, maintain and work 'Beam' stations in India was granted to the Company.

'Beam' stations near Kirkee and Dhond were constructed by the Indian Radio Telegraph Company, which had its Traffic Office at Bombay. All arrangements for direct communication between Bombay and London were completed and the inaugural ceremony was performed by the Viceroy, Lord Irwin, on the 23rd July, 1927. Telegrams *via* IRT were accepted from the public in India and Burma from 6th September, 1927. The charge for an ordinary telegram to Great Britain and Northern Ireland was fixed at

12 annas per word *via* IRT as against one rupee per word on other routes. The charges for nearly all other destinations in Europe, Africa and America were also lower than those by other routes. The Beam Service was successful from the start. In spite of its infancy, interruptions were few and far between. The number of telegrams steadily rose; it was 15,000 per week toward the end of 1927.

In 1928 experimental work commenced in connection with short-wave transmission and reception and was continued for several months. The transmitting and receiving sets, constructed in the Indian Workshops, were markedly improved, and short-wave transmitters manufactured in Calcutta Telegraph Workshops were installed during 1932 and 1933 in Jutogh, Peshawar and Delhi.

During the year 1939, the following important wireless works were completed: (a) Installation of short-wave transmitters and receivers at Calcutta, Delhi, Jodhpur, Bombay and Poona; (b) installation of medium-wave equipment at Car Nicobar; (c) installation of medium-wave and short-wave receivers with remote control apparatus at the Aerodrome Control Buildings at Dum Dum (Calcutta), New Delhi and Karachi; (d) construction of Adcock Direction Finding Stations at Gaya and Allahabad; (e) dismantling of the obsolete 5-KW Spark transmitter at the Bombay radio and the 25-KW Long wave transmitter and Receiver at the Madras Fort Radio.

On 1st July 1939, the existing Wireless Telegraph Divisions stationed in Bombay and Calcutta were amalgamated with the Telegraph Engineering Divisions. The main office, under an Assistant Chief Engineer, Wireless, was in the Directorate dealing with training, experiments, examination and testing work. The Director-General's examination for Certificate of competency as Wireless Operators was placed under an officer who was responsible to the Electrical Engineer-in-Chief at Calcutta.

WORK IN COMMITTEES

The International Radio Telegraph Convention at Washington in October-November, 1927, the first of its kind after 1912, was attended by Mr P. N. Mitra and Mr P. J. Edmunds of Indian Posts and Telegraphs; the former was the first Indian to be given such responsibility. A new convention was drawn up and signed by representatives of over 70 Governments, to come into force from 1st January, 1929.

In the field of International Telecommunication, India played an important role. At Madrid in 1932, at Cairo in 1939, at Atlantic City in 1947, and at Paris in 1949, India was fully respresented. The Madrid and Cairo Conferences were administrative ones at which Telegraph, Telephone and Radio regulations were revised. India fell in line with the International Regulations by revising its Telegraph and Telephone and Radio rules and regulations.

The Atlantic City Conference held in 1947 was a Plenipotentiary Conference and India was represented by a large and exclusively Indian delegation. This Conference redesigned the structure of the International Telecommunication Union and brought into being the General Secretariat of the Union. Fully appreciating the need of the entire world for the frequency pattern, it devised a new frequency allocation table to provide for new services, such as Broadcasting, Aeronautical, Mobile and Maritime Mobile services, etc.

India's active part in this important Conference can be seen by its membership in the various Boards and Committees. India had a standing delegation in the Provisional Frequency Board which was entrusted with the work of preparing a new draft list of the World Frequency Usage, and India had the honour of being elected to the Chairmanship of the Technical Principles Committee. She was elected to International Frequency Registration Board with a standing member on it.

India took part in the 5th Reunion of CCIR and an Indian Chairman was appointed for the Study Group No. 12 for determining maximum power necessary for broadcasting in tropical zones. She became Chairman of Region 3 which produced the 'assignment plan' for all the countries of South East Asia. In the High Frequency Broadcasting Conference she was elected to the Vice-Chairmanship of the Technical Plan Committee.

In the Paris Conference, India was represented by a three-man delegation. They were able to impress on the Conference the need for the unification of Tariffs, and they succeeded in their efforts.

On the Commonwealth Communication side, India was a Member of Commonwealth Telegraph Conference. With the creation of Commonwealth Communication Council, India was represented in all the four meetings and in accordance with the resolution of the 3rd meeting, the Indian Radio and Cable Co. was taken over by the Indian Government and it became a

separate Department, called the 'Overseas Communication Services', from January 1, 1947. India had a Resident Delegate in London, who represented the country in the Commonwealth Communication Board. India was represented on the Provisional Frequency Board by Shri S. S. Moorthy Rao. The Burma Government requested Shri Moorthy Rao to represent it also.

'THE UNTOUCHABLE'

During 1947, when the country was partitioned, short-wave wireless stations were opened at Srinagar, Jammu, Jullundur, Gauhati, Darjeeling, Agartola and Shillong to keep communications intact. Man's madness and vandalism had led hundreds into uprooting telegraph wires as into massacring thousands Only that which would not fall into violent hands could remain serviceable, and the wireless, the Great Untouchable, was the answer.

Tragedy overtook the Indian passenger ship *Ramdas* owned by the Bombay Steam Navigation Company in July 1947, when it sank during a severe storm on the Western Coast. 500 men, women and children went down with it. But the news of the disaster reached hours later, when some of the more fortunate were picked up by passing boats; *Ramdas* was not equipped with wireless facilities.

Installation of Wireless Telegraph equipment meant not only the provision of costly equipment but also the appointment of specially trained wireless operators, and the companies were loath to incur this expenditure for smaller ships, especially because such ships rarely went beyond the coastal ken. Exemptions from keeping Wireless Telegraph were therefore invariably granted to small ships. The *Ramdas* disaster, however, shook the country and it was immediately decided by the Government not only to withdraw the exemptions but also to instal a number of coastal wireless stations which would enable ships to communicate with the shore. Radio-telephone did not require the service of trained wireless telegraph operators.

The coastal stations were located at Ratnagiri, Karwar and Mangalore. The Mangalore station started working in April 1949 and the other two by May 1950.

Apart from these stations, the Government asked private steamship companies to operate their own Radio-telephone stations at minor ports like Rewas, Bedi-Bunder and Bhavnagar.

In 1947, the Government of India formed a Civil Aviation Department. Wireless stations doing aviation duties were taken from the Posts and Telegraphs and were placed under the Civil Aviation Department. Posts and Telegraphs was left with coastal services, meteorological services and aeronautical communication. From 1st November 1949 a revised rate of fees for different types of Wireless Licenses was brought into effect.

Another important feature of the 1950 stage was Monitoring and Detection of illegal transmission. By means of portable direction finders, nine illegal transmitters in the Bombay area and one illegal transmitter in the Delhi area were located. The services of the Monitoring staff at Bombay were lent for locating transmitter illegally operating in Sangli and Jaipur. Culprits doing roaring business were brought to book.

ACCENT ON ASIA

The highlight of activities during 1950 was the opening of the Radio-telephone Service to Indonesia—the first link with South East Asia. The direct Radio-telephone was inaugurated on 2nd October, 1950. President Rajendra Prasad at the Indian end greeted President Soekarno at the Indonesian end, and *vice versa*. Indonesia has warm feelings towards India because of the latter's contribution to the former's independence. The two friendly countries came even closer on account of the new service. Wireless helped in knitting South-East Asia together.

Radio-telephone facilities were provided at Calcutta and Bombay during December 1950 and February 1951 respectively to enable ships piloting along the coast to be in contact with coastal stations. Similarly, another public service was opened during the pilgrimage season at Haridwar and Uttar Kashi. About 360 messages were dealt with by this system between pilgrims on high altitudes and relatives on low planes.

Radio-telegraph messages handled by the departmental wireless stations for 1950-51 were 5,85,000. The number of Broadcasting Receiving Licences issued during that period was 5,32,000. The number of licences other than Broadcasting Receiving Licences issued was 34,500.

The process of wirelessly tying Asia together was on. On 15th March, 1951, communication between India and Thailand by means of Wireless Telephone was established. When Asian Games were held in India from 1st to 15th March, 1951, a direct Radio-telephone Service between India

and Japan was opened as a temporary measure. Another innovation was the Radio-Tele-Photo Service. This service to Japan was established on 3rd March, 1951 and was kept open till 15th March, 1951. 35 photos were transmitted. Although at very short notice, the service invoked praise from Japan, the most enterprising nation represented at the 'Ashiad'.

In the Five-Year Plan, two schemes known as High-Power-Wireless Link and Monitoring Scheme are mooted. These aim at installing high-power wireless stations at Delhi, Bombay, Madras and Calcutta for clearing inland traffic, and for installing monitoring stations at Delhi, Nagpur, Calcutta, Bangalore and Bombay. The orders for high-power equipment have since been placed and the scheme is expected to cost Rs 60 lakhs. Four transmitters will be installed at Delhi, Madras, Bombay and Calcutta to enable them to work with one another, four telegraph channels being provided with each transmitter. The Overseas Communication Service have also made extensive plans for increasing and augmenting the wireless services to other countries. The vision of an extended wireless network is unfolded.

XIII. From P. W. D. To P. and T.

ANY VAST and sound organisation, like a mighty river meeting the sea, traces its origin to a very slim beginning, to a trickle. Natural growth implies expansion of the small to the large. Sturdy organisations, like sturdy oaks, grow slowly. The present-day sprawling Post and Telegraph Department, for instance, occupied a small corner of the Public Works Department in 1851. Dr O'Shaughnessy belonged to the Public Works Department all through the experimental stage. A regular, separate Department was opened around 1854 when the telegraph facilities were thrown open to the public.

The Telegraphs Department during 1854—57 comprised a Superintendent of Telegraphs, with three Deputy Superintendents at Bombay, Madras and Pegu in Burma. There were Inspectors at Indore, Agra, Kanpur and Banaras, and an operating and maintenance staff.

THE COMPLAINT BOX

Dr O'Shaughnessy was the first Superintendent of Electric Telegraphs in India, later to become the first Director-General. He took an inordinate interest in keeping the service free from complaints and he enforced strict discipline on his subordinates. Writing about the quarter ending 31st October, 1854, he remarked:

'I have invited complaints by advertisement in every paper in India. I have encouraged complainants to expect refunds. That refunds have been made for all repeated messages, justly complained of, since the 10th of September, the date of the Government orders on this subject. I have also given instant attention to every complaint made either to myself or to my subordinates, and I can safely affirm that out of this very extensive

correspondence this has caused, I have never (but in two cases) evinced any impatience of the instances in which frivolous and captious complaints have been preferred'. His high sense of public duty resulted in the following remarkable results:

August—

Messages despatched			2,339
No. of complaints			12
Frivolous			8
Just			9
	Value .	Rs	104

September—

Messages despatched			2,711
All complaints			9
	Value .	Rs	133

October—

Messages despatched			3,454
All complaints			23
Frivolous			2
Just complaints			21
	Value .	Rs	220 As 8

Thus there were 'in all 44 complaints, the frivolous included, on 8,577 despatches, being only 0·51 per 100 on the business of the three worst months of the year. The value of the messages complained of was Rs 438 As 12, on cash transactions amounting to Rs 41,798 As 4, being only 1·09 per cent'. With becoming modesty, Dr O'Shaughnessy added: 'These results scarcely need a comment'.

Here is further evidence of vigilance. 'In June of 1866, an attempt was made by a wealthy banker in Ajmer to bribe the Telegraph Master, and to induce him to divulge' wrote Dr O'Shaughnessy, 'the contents of the opium messages that might be received at that station'. This was reported to his superiors by the Telegraph Master himself. In consultation with the Deputy Commissioner, a trap was laid to catch the culprits red-handed. The result was their conviction and punishment 'by fine of Rs 4,000 with six months rigorous imprisonment'. The Government employees who resisted temptations and helped in catching the offenders were 'rewarded with

donations varying from Rs 50 to 200 for their conduct on the occasion'.

I.E.T.D. INDIANISED

The Indo-European Telegraph Department, which later came to be known as the Overseas Communications, was administered by a Director-in-Chief whose headquarters were in London. On the 15th February, 1888, it was made over to the Director-General of the Indian Telegraph Department. It was decided that the Administration Reports of the two Departments, Indian Telegraph and the Indo-European Department, should be separated so as to show how the finances of the country were affected by each unit.

The operations of the two separate services, Post Office and Telegraph Department, developed side by side with the general development of the country, and by the year 1888, it became possible to regard the Post Office and Telegraph Department as quasi-commercial departments, which, according to the Resolution of the Government of India dated 28th July 1888, were 'maintained for the purpose of rendering particular services on payment made, for the services rendered, or for the articles supplied, and the functions of which are not part of the ordinary ideas of Government or Administrations'.

FOOTBALLED FROM P.W.D.

During 1902, the superior establishment was reorganised. Owing to the great expansion of the Department since 1877, an increase in the number of the higher posts and also of the divisional charges had been found necessary by the Government of India. With effect from 16th March, 1903, two Deputy Directors and five Divisional charges were added; and the ultimate effect of the reorganisation scheme, in a tabular form, looked:

Old Ultimate Scale	Revised Ultimate Scale
1 Director-General.	1 Director-General.
1 Dy. Director-General.	1 Dy. Director-General.
2 Directors.	2 Directors.
	2 Directors.
4 Chief Superintendents.	2 Chief Superintendents Class I.
	2 Chief Superintendents Class II.

Old Ultimate Scale		Revised Ultimate Scale	
10	Superintendents 1st Grade.	23	Superintendents 1st Grade.
13	Superintendents 2nd Grade.	13	Superintendents 2nd Grade.
15	Asstt Supdts Class VI 1st Grade.	9	Asstt Supdts 1st Grade.
18	Asstt Supdts Class VI 2nd Grade.	19	Asstt Supdts 2nd Grade.
18	Asstt Supdts Class VII 1st Grade.	13	Asstt Supdts 3rd Grade.
19	Asstt Supdts Class VIII 2nd Grade.	14	Asstt Supdts 4th Grade.
101		101	

The reorganisation of the signalling establishment was sanctioned by the Government of India on 22nd July, 1902. The strength of general service signallers was fixed at 66 per cent and of local service signallers at 34 per cent of the total strength, instead of 60 per cent and 40 per cent, respectively. The pay of local service signallers during the first ten years was increased. A new grade of 20 Traffic Sub-Assistant Superintendents on fixed pay of Rs 350 a month was created, reducing the number of General Sub-Assistant Superintendents from 81 to 72; and the number of permanent Telegraph Masters was increased from 186 to 292.

The reorganisation improved the prospects of the junior officers by tending to prevent a block in promotion; it also improved the position and prospects of the signalling staff, enabling the recruitment 'of a better class of lads than we have of late years been able to do'.

During 1905, the control of Telegraph Department, except as regards building and electricity, was transferred from Public Works Department to the newly constituted department of Commerce and Industries.

The capital of the Department which began with Rs 24,300 in 1850 increased to Rs 8,73,60,549 at the end of 1905. The receipts of 1850-51 which were Rs 6,000 increased to Rs 11,59,789 and the working expense which was Rs 5,380 rose to Rs 82,03,715. Actually, in the first years the Department worked at a profit between 1850—52, after which it was working at a loss upto 1875-76. During 1877 the Department earned a profit of Rs 97,995 and during 1904-05 the net revenue was Rs 33,94,182, which formed 3·88 per cent of the capital outlay.

CIRCLING THE SQUARE

Another reorganisation took place in 1910-11. The Circle Scheme was introduced. It embodied a geographic division of India into zones; 40 years later, railways were to be regrouped on the same principle. Preliminary measures were taken the previous year including the abolition of all sub-divisions. On the 1st April, every Circle Officer was at his headquarters and, with the exception of two, so were all the Superintendents. Commented the Annual Report:

> As was only to be expected, on the introduction of a change of such a radical nature, it took some time for things to settle down, and it is due to the manner in which all ranks co-operated that the disturbance to work was so small. The chief difficulty experienced arose from the clerks requiring some time to get accustomed to their new duties and a great deal of extra work was thus thrown on Superintendents.
>
> 'While it has been found possible to decentralise to a very great extent in connection with construction and general matters it has not been possible to effect the same amount of decentralisation with regard to traffic. The staff is borne on one cadre and promotions and changes must therefore be dealt with at the headquarters. The distances in India are so great that the main traffic centres lie within different circles. In order to ensure uniformity of procedure, all through and international traffic has to be dealt with by headquarters'.

'POSTS AND TELEGRAPHS'

On the eve of World War I, in 1914, the next big administrative change came. The Postal Department and the Telegraph Department were amalgamated under a single Director-General. The process had started in 1912, but it was completed in 1914. On the 16th April 1923, the administrative control of the Department was footballed to Industries and Labour. A Financial Adviser was attached to the Department from the same date. During 1923-24, 152 questions relating to the Department were asked and answered in the Legislative Assembly. Posts and Telegraphs has always attracted a great deal of interest from law-makers.

During 1925-26, the finances of the Department showed a surplus of about Rs 49 lakhs. With effect from 1st April 1925, the accounts of the Indian Posts and Telegraphs were re-constituted, incorporating the principles of commercial book-keeping so as to bring out as accurately and clearly as possible the true financial picture as to (1) the extent to which the Department was imposing a burden on the general taxpayers or bringing in revenue to the Exchequer; (2) how far each of the four constituent branches of the Department, namely Post Office, Telegraph, Telephone and Wireless was contributing towards this result; and (3) whether the rates charged to the public for the various postal and telegraph and telephone services were inadequate or excessive.

The Posts and Telegraphs, like all public and private undertakings, was a victim of the universal financial and economic depression which crashed on the world in 1930. During 1931, numerous special measures of economy had to be introduced according to the advice of the Posts and Telegraphs Sub-Committee of the Retrenchment Committee presided over by Sir Cowasjee Jehangir, Jr. Naturally, the adoption of the various measures of retrenchment could not but have an adverse effect on the emoluments and interests of the personnel of the Department. Only one difficult issue was referred to the Legislature; as a result a service association lost official recognition for a short period.

ON 'QUESTIONS' IN THE ASSEMBLY

Even the reconstructed accounting system of the Posts and Telegraphs in 1925 continued to be challenged in the Legislative Assembly and in the press. With a view to meeting these criticisms, the Government of India appointed a Posts and Telegraphs Accounts Enquiry Committee under the Chairmanship of Sir Cowasjee Jehangir, Jr. The Committee submitted its report to the Government of India in May 1931. Broadly speaking, the recommendations which the Government of India decided to accept were:—

(1) A small addition estimated at about Rs 70,000 per annum to receipts, representing the effect on the Department's revenues of withdrawing concessional rates for foreign state telegrams.

(2) A decrease of about Rs 5,00,000 per annum in working expenses on account of the reduction of pensionary liabilities.

(3) An increase of about Rs 375,000 in interest on capital outlay, due to the increase in the depreciated value of the capital at charge on the 1st April 1925 resulting from the enhancement of the effective lives of assets.

(4) The exemption of the department from the payment of interest surcharge on losses arising out of inland press telegraph traffic concessions. These losses amount to about Rs 24,00,000 per annum.

(5) A reduction in the cumulative loss to the end of 1930-31, on which interest surcharge was payable by the Department, by nearly Rs 1,50,00,000. This was due to the retrospective application of certain decisions with effect from 1st April 1925 for the purpose of determining the amount of the loss.

The financial results of the working of the Department for the year 1931-32 were as follows:

	Receipts	Expenditure	Surplus (+) or Deficit (—)
	Rs	Rs	Rs
Post Office . . .	7,36,84,265	7,88,21,907	(—) 51,57,642
Telegraphs . . .	2,66,10,969	3,03,21,907	(—) 37,10,938
Radios	418,042	10,72,524	(—) 654,482
Telephones . . .	57,45,849	56,27,933	(+) 117,916
TOTAL .	10,64,59,125	11,58,44,271	(—) 93,85,146

It will be noticed that even in those days of depression, the telephones showed a small surplus. Its earnings these days are much more, as the telephones showed a profit of Rs 3,28 lakhs in 1952 as against the loss of Rs 81 lakhs sustained by the Post Offices. The little brother is now the one who is keeping the home fires burning.

According to the re-constituted accounts, the Department showed a profit during 1926-27. As a result of the improvements in the scale of pay and other conditions of the services throughout the Department, expenditure overtook receipts in 1927-28. The position was revised early in 1930 and on the assumption that revenue would continue to increase at the average

rate of growth during the previous three years, it was estimated that the Department would again be working at a profit in 1934-35 without having recourse to any enhancements of postal or telegraph charges.

In 1930-31, however, owing to the Great Depression, the revenue which had for some years past been increasing at an average rate of 27½ lakhs per annum, crashed heavily (by about 52 lakhs), an almost unprecedentcd happening in the history of the Department, and although steps were taken to curtail expenditure as soon as the contraction in traffic became apparent, the loss for that year reached the staggering sum of Rs 133½ lakhs. As the loss became very heavy it became necessary to increase the postal and telegraphic charges in the latter part of the year and also to introduce various drastic retrenchment measures involving extensive reduction in establishments and emergency deduction from pay and allowances. Introduction of the pay cut from 1st December 1931 and other retrenchment measures, together with adoption of certain recommendations of the Posts and Telegraphs Accounts Enquiry Committee, enabled the Department to show a reduction of about Rs 53 lakhs. Out of a total loss of Rs 93·85 lakhs disclosed by the accounts for the year, a sum of Rs 30·87 lakhs represented the loss in respect of Inland Press Telegraph Traffic and certain other unremunerative activities of the Department. Thus the loss on those activities of the Department which were truly commercial in character amounted to Rs 63 lakhs only. It was a business run on welfare lines. Policies of the Government and the clamour of the Legislative Assembly made further cuts impossible. Commented the Annual Report:

> "It is the accepted policy of the Government that the department should be so administered that there should be neither any substantial profit nor any substantial loss on its working under normal conditions. As has already been indicated, the achievement of this ideal has not proved possible owing mainly to the exceptional economic and trade conditions of recent years. One of the main contributory causes of the excess of expenditure over revenue has been the very extensive revision and improvement of pay of the great bulk of the employees of the department in recent years. This was undertaken with the approval of, and indeed under pressure by, the Legislative Assembly.

"While the department is commonly spoken of as a 'Commercial' one, and though as far as possible it is guided by the commercial considerations in the regulation of its business, it must be realised that in many directions it is debarred from observing strict business principles. Many of the purposes which it is required to serve are unremunerative and, notably, in matters relating to the employment and control of staff, the department is bound by a large volume of statutory and other rules, doubtless necessary for the regulation of a public service, but which in the aggregate involve many restrictions of a kind unknown to private commercial concerns.

"The time and energies of the administrative staff are taken up to some extent by the necessity for attention to the events of by-gone years for the satisfaction of the audit authorities and others, while the pre-occupation of the administration with matters frequently of minor importance at the instance of members of the Legislature and others seriously hampers the performance of the more important current work of the department".

XIV. The Human Factor

DURING THE WAR years, the Department expanded greatly. A glance at comparative figures showing the finances in the year 1939-40 and 1946-47 discloses the Department's expansion:

	1939-40	1946-47
	Rs	Rs
Total Receipts	124·8 million	316·5 million
Expenditure	115·8 „	264·8 „
Surplus .	9·0 million	51·7 million

The capital outlay of the Department during 1946-47 was Rs 47·2 millions. The bulk of the capital outlay under Telegraphs and Telephones was incurred on new telephone projects consisting mainly of trunk lines and new exchanges to provide additional facilities for Civil and Defence purposes.

The capital outlay of the Department upto the end of the year 1952-53 was 640·6 million rupees, of which the outlay on telegraphs, telephones and radio assets amounted to 549·2 million rupees, outlay on building and assets of Post Office Branch 34·4 millions, share of the Government Telephone Board, after adjusting the receipts from the payments to the Bengal Telephone Corporation, 4·1 millions, and the value of the stores in the manufacturing suspense accounts 52·9 millions. There exists a separate Renewals and Reserve Fund which is designed to meet the cost of rehabilitation of assets and assets sold or abandoned without being replaced. A separate Telephone Development Fund also exists. The accumulated surplus of the Department on 31st March, 1953 stood at Rs 150·7 millions.

TECHNICAL CO-OPERATION

In the later years, the Posts and Telegraphs worked in close collaboration with educational institutions and scientific organisations. During the years 1939-45, the contact between the Army Signals and Posts and Telegraphs became more marked. The Department is represented on the Indian Standards Institute committees and has been a great help to it in framing and standardising specifications.

With the development of power networks and communication networks in the country, the question of co-ordination between the Power and Telecommunication Departments became an urgent matter. A Co-ordination Committee was set up by the Government on which there were two members from the Posts and Telegraphs. Many cases involving parallelism of power and Telecommunication lines have been settled, the guiding principle being minimum of expense to the country consistent with safety to personnel. Some experimental data regarding the degree of interference from Power into Telecommunication lines have also been collected.

In recent years, engineers of the Department have been sent abroad on deputations. They have had the opportunity of studying the Telecommunication systems in European and American countries and also of meeting renowned engineers. This laid the foundations of close liaison between Telecommunication engineers in India and abroad. Several improvements in development and techniques will be introduced in the Posts and Telegraphs as a result of the latest experience gained by the deputationists.

There is enormous scope for the active collaboration of the Posts and Telegraphs with the Defence Department and Scientific Institutions. With the establishment of Indian Telephone Industries, Bangalore, which manufactures telephone equipments, technical responsibility has increased. The great handicap pertains to the absence of a Research Organisation such as exist in other advanced countries. However, with the establishment of a Research Centre in the Posts and Telegraphs, and with the increasing collaboration with scientific institutions, the Defence Department, the Indian Telephone Industries, and the proposed Cable Factory, the future of scientific research looks bright.

During the war years, the Technical and Development portion of the work was being conducted by a Branch attached to the Directorate itself, under an Additional Chief Engineer. Under the Telecommunication Deve-

lopment Scheme, this organisation was responsible for designing, planning and executing works. After the war, a comprehensive scheme for the first five-year phase of the 15-year post-war development plan was formulated, and the organisation separated and designated Technical and Development Circle which was shifted to Jabalpur in June 1950.

Designing of Auto, Manual and Trunk Exchanges, and design of Carrier System for the All-India network, are the main functions of this Circle. During the short period it has been in existence, it has to its credit the installation of Auto Exchanges at Tishazari (Delhi), Simla and Nagpur, Manual and Trunk Exchanges at Dehra Dun and Jaipur, and the cutting over of many exchanges under the Bombay Telephone District. At present the execution of the Auto Exchanges of Dhanbad coal-fields area and cable planning of many stations are being done by this Circle. A planning unit is at present at work finalising the telephone development plans of Delhi and greater Delhi.

MAN-POWER

The Department took considerable interest in the welfare of its employees. In the early thirties the staff recruitment was on a communal basis. On the 31st March, 1939, the total number of persons employed by the Department was 117,151. The figures included 21,475 extra departmental agents who were not wholetime Government servants and about 3,000 members of the Audit and Accounts staff. On 31st March, 1939, the number of all-India unions or associations of employees of the Department recognised by the Government was eleven. The total membership of all the recognised unions was 41,859. At the end of 1938-39, 58 Co-operative Credit Societies (with a membership of 66,043 and a subscribed capital of Rs 29,61,000) functioned in the Posts and Telegraphs Department.

The total strength of the staff of the Department on 31st March 1947 was, permanent 131,634 and temporary 37,977, out of which 598 were permanent gazetted officers and 303 temporary gazetted officers. The total number of women employed in the department on the same date was 693 permanent and 1,248 temporary, out of which two were gazetted officers. The unions, recognised by the Government, had now increased to 17.

In order to look after the welfare of the staff, the Department set up a new welfare organisation under a Deputy Director in the headquarters at

Delhi, with Labour Officers in the Circles and the Workshops at Calcutta, Jubbulpore and Bombay.

Opening of co-operative credit societies, staff canteens, and night schools began to be encouraged around 1947. The number of co-operative credit societies rose to 50, with a membership of 74,554 and a subscribed capital of Rs 25,45,000.

Next three years showed further progress. The total strength of the staff of Department on 31st March, 1952 was, permanent 170,184 and temporary 49,526. The women employees on that date were 1,295 permanent and 2,633 temporary. The number of co-operative credit societies was 46 with a total membership of 107,330. The subscribed capital of these societies amounted to Rs 29,04,000.

THE ATHLETES

The First All-India Posts and Telegraphs Athletic meet was held during December, 1950 at Jabalpur. It was organised by the Training Centre Recreation Club and was a tremendous success; 215 athletes participated in the meet. This was followed by the second All-India meet also held at Jabalpur, followed by the third All-India meet at Delhi, which was held at the National Stadium in February, 1953. This meet was a tremendous success and no less than 17 departmental records were bettered.

Along with the athletic meets Posts and Telegraphs All-India badminton tournaments were organised, the last one having been held at Delhi. It is expected that in the not so distant future All-India tournaments in other events like cricket, hockey and football will also be organised.

One of the main items designed and introduced during the first athletic meet held in 1950 was the electric race timer, which electrically recorded the starting and finishing of races and displayed the time on a clock with a huge dial 5′ in diameter.

TRAINING CENTRE

Special attention has always been paid by the Indian Telegraph Department to its staff. Dr O'Shaughnessy, when he started the 'Electric Telegraphs' in 1853, had to start with absolute 'raw hands' most of whom had operated only the semaphore stations. We read that it had been possible, by giving them intensive training for six months, to make them thoroughly conversant with

the art of telegraph signalling. Since then, elaborate training arrangements have been made for the telegraph signallers with one or more training class in every circle.

The training of engineering personnel of the Indian Posts and Telegraphs Department had been for a long time the responsibility of the Electrical Engineer-in-Chief and the Training Centre was originally located in his office in Alipore Storeyard, Calcutta. In 1942, the training classes which were being conducted at Calcutta were transferred to Jabalpur and were placed as a separate unit with a Divisional Engineer, Telegraphs, in charge under the administrative control of the Electrical Engineer-in-Chief. From 1st April, 1948, with the abolition of the post of the Electrical Engineer-in-Chief, the Training Centre has been placed under the direct administrative control of the Posts and Telegraphs Directorate, New Delhi. Engineering maintenance staff require highly specialised training and for this reason they have always been centralised.

The Training Centre instructs only those Posts and Telegraphs employees who have already been recruited to the Department by competitive examinations or otherwise.

The Divisional Engineer, Telegraphs, is assisted by a team of Assistant Engineers, Engineering Supervisors, Wireless Supervisors, Wireless Operators, Repeater Station Assistants, Telephone Inspectors, Telegraphists, Mechanics, etc. During the year 1951-52, 538 persons in the following cadres received training at the cost of Rs 746,000:

Assistant Divisional Engineer, Telegraphs,
Engineering Supervisors,
Repeater Station Assistants,
Telephone Inspectors,
Telegraph Masters,
Wireless Operators,
Wiremen,
Cable Jointers,
Telegraphists.

There are eleven main laboratories in the Training Centre for conducting practical classes for the various categories of trainees. Every laboratory is equipped with prototypes of the particular equipment in use in the Department so that the trainee may be able to handle the equipment under actual

working conditions. Education is given through lectures, demonstrations, tutorial classes, practical experiments in laboratories and practice in Telegraph Workshop. Emphasis is placed on the practical aspects of the subjects in order to enable the trainees to develop full confidence in handling the Telecommunications Equipment. Theoretical lectures on various electrical and communication engineering subjects of the required standard are given to supplement the practical courses in the laboratories.

In addition to the general system of training, special aids are utilised. A 16 mm sound projector is available which is used for educational and informative film shows every Saturday. The Training Centre has purchased a number of educational films on various technical subjects. The Training Centre has an up-to-date library having a large number of books dealing with Telecommunication, engineering and allied subjects. The total number of books is over 5,000. The library also subscribes to 45 technical journals.

To ensure that the trainees remain physically fit, physical culture has been made compulsory. Adequate facilities exist for outdoor games like tennis, football, volleyball, etc., as well as for gymnastics and athletics. Every trainee is expected to take active part in one or more of these physical activities. As the present premises of the Training Centre building are found to be inadequate for its progressive development, a new building on modern lines is being constructed at Jabalpur. This building will have hostels and residential quarters attached to the Institution.

CONFERENCES

The Department took part in various conferences in the course of its growth.

International Conferences

Place	Year	Subject	Indian Representatives
St. Petersburgh . .	1874-75	Telegraph	Mr D. G. Robinson
London . . .	1879	„	Mr H. A. Mallock
Berlin . . .	1885	„	Mr Bateman Champion
			Mr C. H. Reynolds
Paris . . .	1890	„	Mr H. A. Mallock

Place	Year	Subject	Indian Representatives
Budapest	1896	Telegraph	Mr P. V. Luke
			Mr B. F. Flinch
London	1903	,,	Mr H. A. Kirk
			Mr S. H. C. Hutchinson
Berlin	1906	Radio	Not represented
Lisbon	1908	Telegraph	Mr H. A. Kirk
			Mr F. E. Dempster
London	1912	Radio	Mr H. A. Kirk
			Mr F. E. Dempster
Paris	1925	Telegraph	Mr G. R. Clarke
			Mr P. N. Mitra
Washington	1927	Radio	Mr P. J. Edmunds
			Mr P. N. Mitra
Brussels	1928	Telegraph	Mr H. A. Sams
			Mr P. N. Mitra
Madrid	1932	Radio and Telegraph	Mr M. L. Pasricha
Cairo	1938	Do.	Mr Krishna Prasada
			Mr P. J. Edmunds
			Mr S. Bannerjee
			Mr H. N. Srivastava
Atlantic City	1947	Do.	Mr S. Bannerjee
			Mr S. S. Moorthy Rao
			Mr H. R. Thadani
			Mr B. V. Baliga
			Mr M. L. Sastry
			Mr Md. Sadiq Kari
			Mr Syed Abdul Sattar
Paris	1949	Telegraphs	Mr H. R. Thadani
			Mr M. Rajagopal
			Mr M. A. J. Vasnaik
Geneva	1949	Radio	Mr S. A. Moorthy Rao
			Mr V. Sundaram
			Dady S. Major

Place	Year	Subject	Indian Representatives
Geneva . . .	1949	Radio	Mr M. L. Sastry
Buenos Aires . .	1952	Tele-communication	Mr Krishna Prasada
			Mr Jagdeesh Prasad
		Plenipotentiary	Mr M. L. Sastry
			Mr M. V. Pai

THE TOP BRASS LISTED

Director-Generals of Telegraphs

1. Sir William O'Shaughnessy, 1857-1861.
2. Lt. Col. C. Doughlas, 1861-1865.
3. Maj. Genl. D. G. Robinson, 1865-1877.
4. Col. R. Murray, 1878-1883.
5. Sir Albert-Cappel, 1883-1890.
6. Sir W. Brooke, 1890-1895.
7. C. H. Reynolds, 1895-1899.
8. C. E. Pitman, 1899-1900.
9. F. G. Maclean, 1900-1903.
10. Sir Sydney Hutchinson, 1903-1907.
11. T. D. Berrington, 1907-1911.
12. F. E. Dempster, 1911-1912.

Director-Generals of Posts and Telegraphs

13. Sir Charles Stewart-Wilson, 1912-1913.
14. Sir William Maxwell, 1913-1918.
15. Sir Geoffery Rothe Clark, 1918-1925.
16. Sir Ganen Roy, 1925-1927.
17. Sir Hubert Arthur Sams, 1927-1932.
18. Sir Thomas Ryan, 1932-1934.
19. Sir Gurunath Bewoor, 1934-1941.
20. Sir Harold Shoobert, 1941-1945.
21. Sri Krishna Prasada, 1945-1953.
22. Sri H. L. Jerath, 1953- .

Chief Engineers

1. Ivor Kradock Thomos.
2. Richard Meredith.
3. William Suterland, 1921.
4. G. P. Roy, 1923.
5. Bagshawe Edward Leonard, 1928.
6. De Monte Frank, 1931.
7. Purssell, Richard Stanley, 1934.
8. Brokenshaw, A., 1938-1941.
9. Edmunds, Sir Percy James, 1941.
10. Sir Norman Fredrick Frome, 1946.
11. B. R. Batra, 1947-

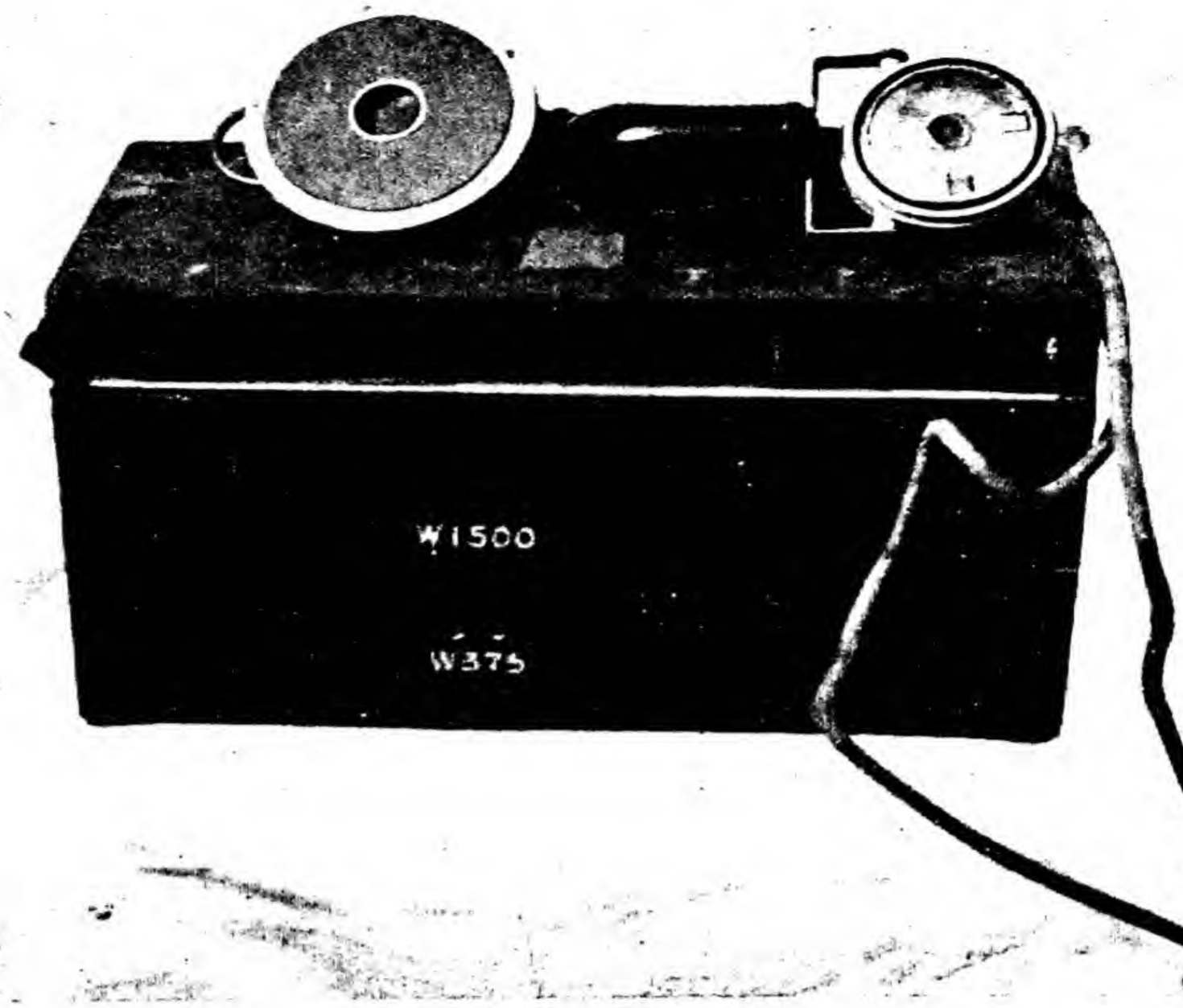
XV. Sinews of a Service

THE WORKSHOP is as old as the Indian Telegraph. If it never produced an epoch-making invention, it ever was the sinews of a hefty and growing public utility. Visitors to our workshops in Alipore, Jabalpur and Bombay are generally amazed at the excellence and number of items made there. But above all the task is of maintenance, of replacement, and our workshops have excelled in them. They have set an example as to what Indian hands can make and Indian minds design. In peace they have provided wires and phones to those who want them; in war they have turned out instruments of defence.

The first Central Workshop was started in Agra as early as 1855, under the shadows of the Taj Mahal. It was run by one Mr Crible. Specialisation was still far from the Indian shores, so the Agra Workshop had to be everything to everybody. Instruments of all kinds were demanded by all kinds of departmental offices. The range of supplies amounted to Rs 500 per month, a tidy sum in those days; it rose five thousand-fold by 1951, in the neighbourhood of two crores of rupees. The progressive story of Telecommunications in India is the story of the workshop writ large.

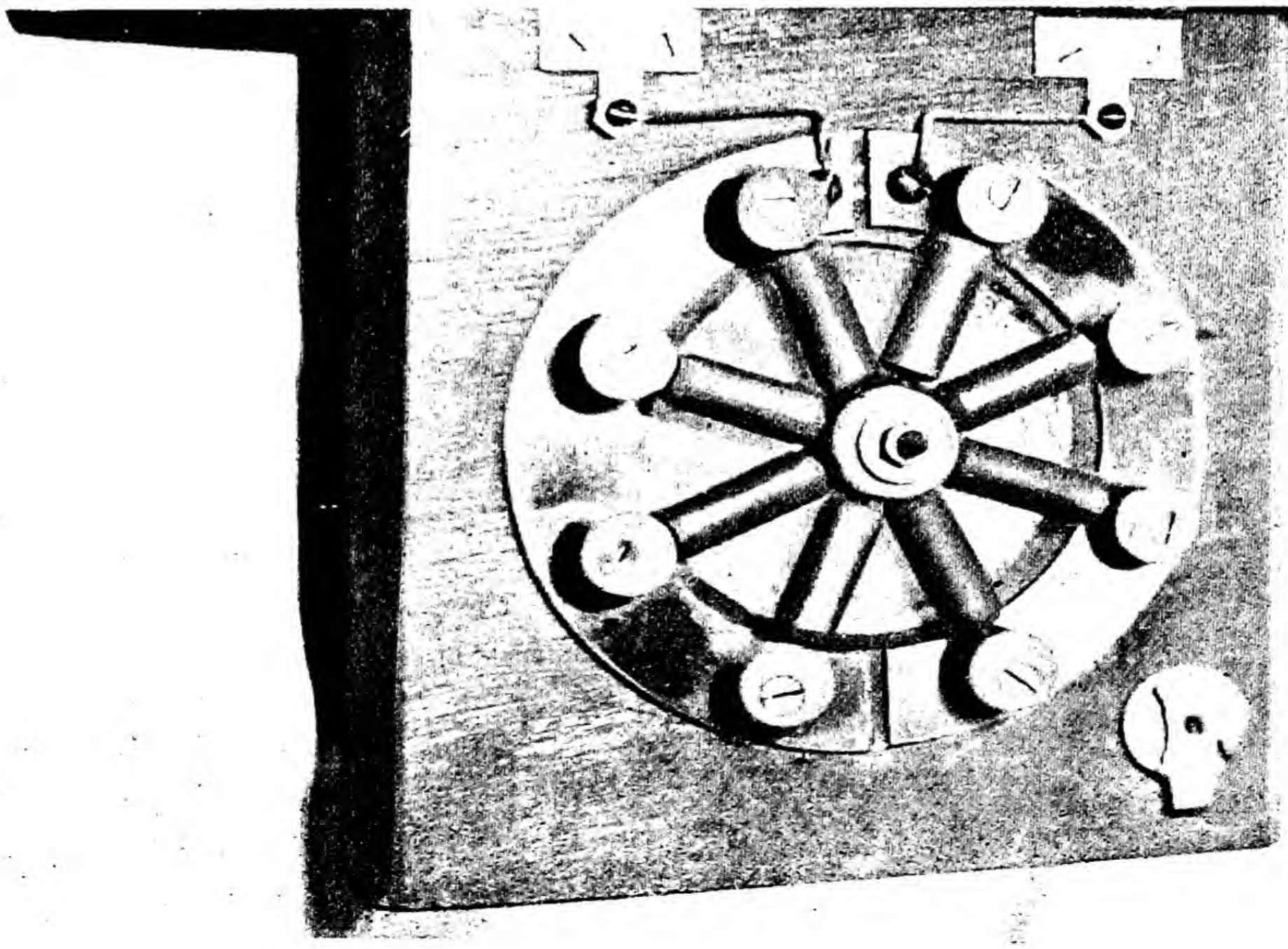
THE FIRST CABLE

The Telegraph Workshop at Calcutta was the Agra one's contemporary, almost. It had a cable machine which was excellent, but owing to the scarcity of perfect 'core', results were next to nothing. When fresh 'core' was obtained from England, 6,810 yards of new cable were manufactured during 1870. It was amazing considering the time and place. In 1868, machines for covering insulated core with hemp and iron wire were erected for the purpose of manufacturing cables required for river crossings, and

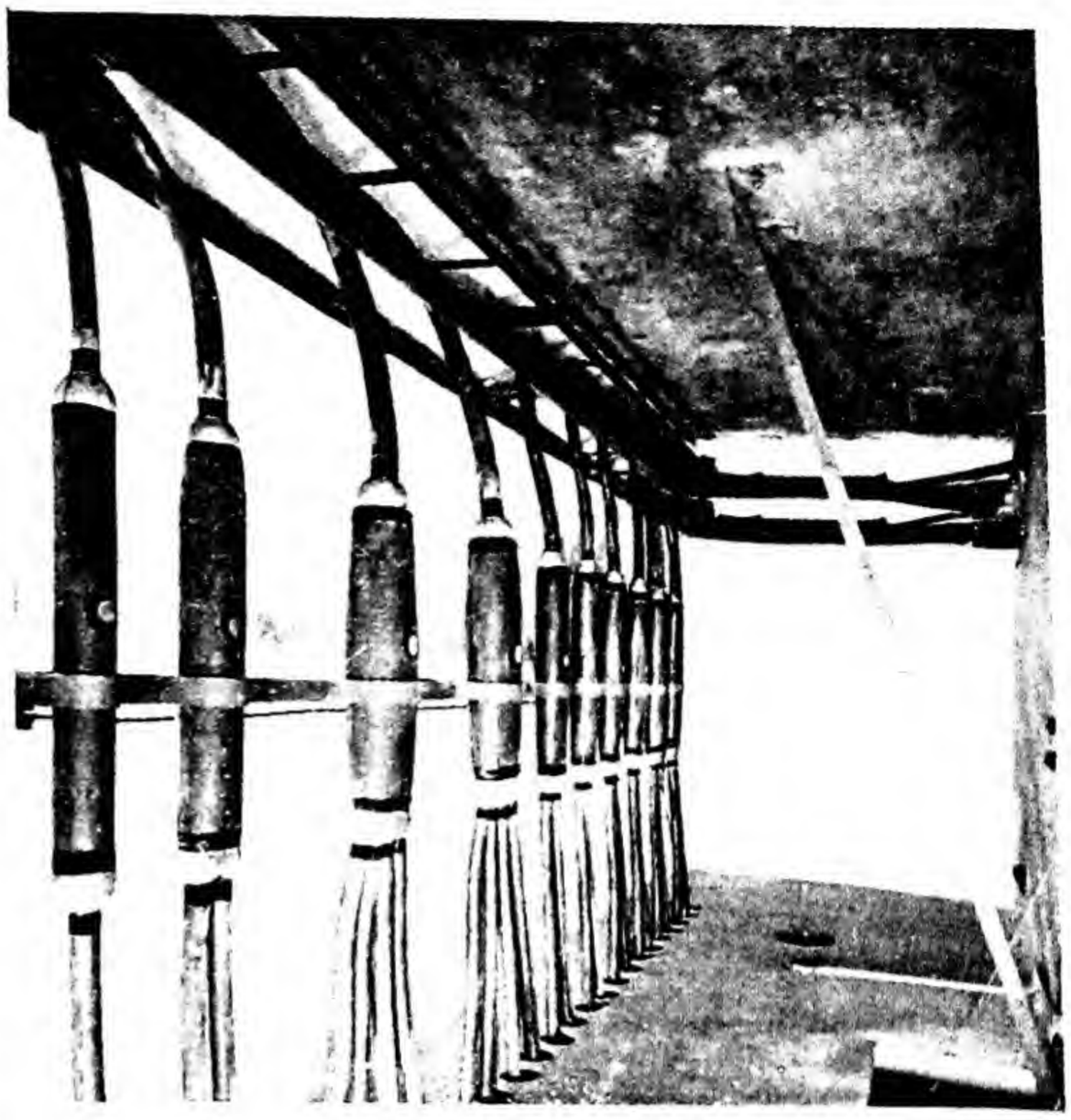


Old type Portable Telephone

Old pattern wall set (Back view of Transmitter)

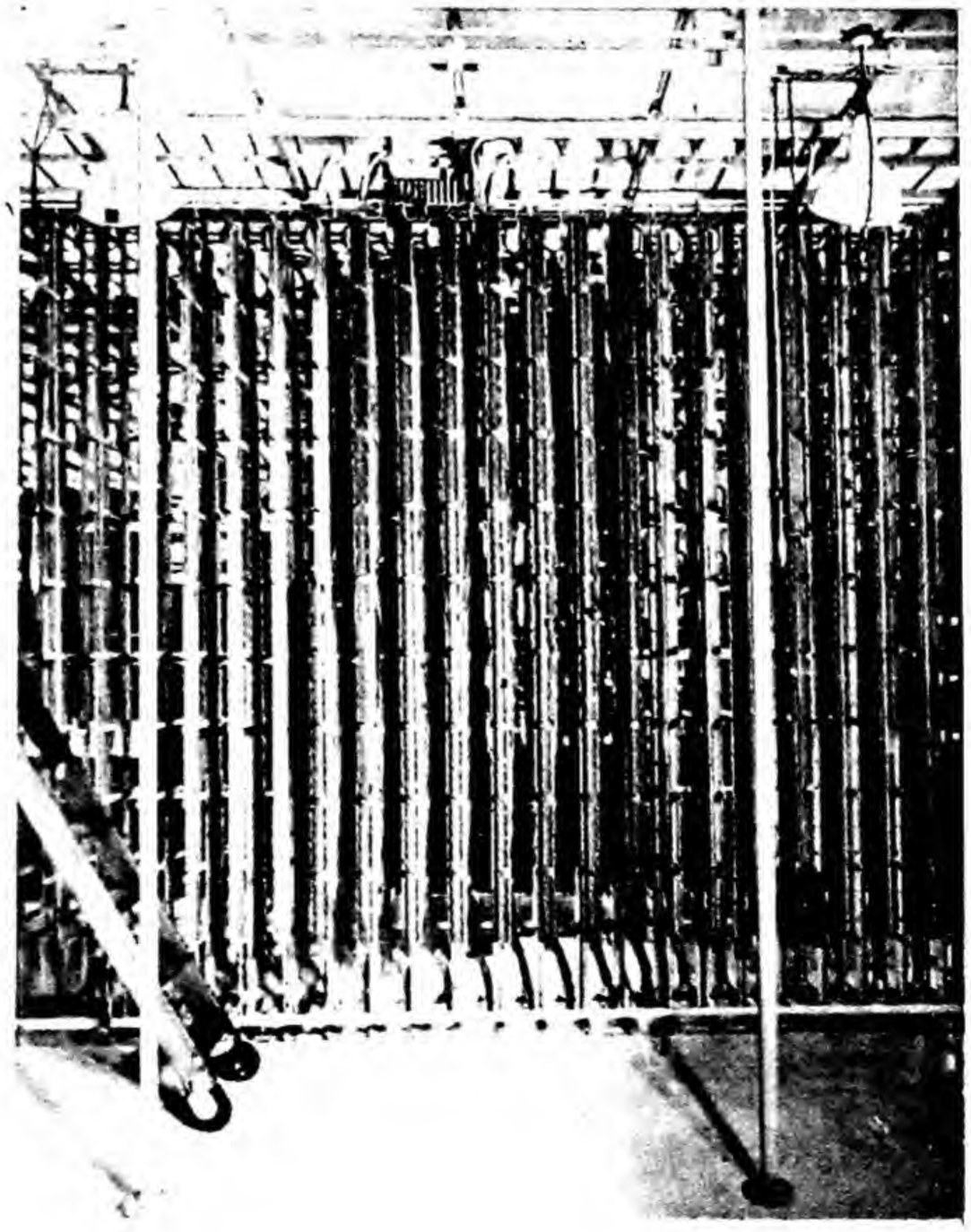


Cable jointing—jointing is in progress—the officer watching by



The cable chamber

The Main Distribution Frame—The underground cables are joined here to telephone exchange equipment



by 1870 this crucial work was in full swing. The first cable that was manufactured, and part of which was laid across the Hooghly at Barrackpore, measured 3·8 miles. This cable was composed of Hooper's Patent India Rubber core served with two layers of tannined jute, and the whole protected by twelve strands of No. 5-1/2 galvanised iron wire. The strength of this cable was 13·3 tons, its weight per statute mile 3·6 tons, and its cost Rs 1,895 per mile, including delivery of material at Alipore. It was one of India's 'firsts,' and a very proud one. Since then, many more miles of cables have been manufactured; but the first thrill was unique. In the later cables, four layers of tannined hemp protected by twelve strands of No. 3 wire were used; the cable was thicker and stronger but also more expensive. The quantity of cable that could be manufactured at the Workshops was about two miles per week—two miles per every 48 working hours.

The total cash expenditure under Stores and Workshops amounted to Rs 397,150 in 1871, the amount of workshops alone being Rs 189,910. The output of the Workshops at that time amounted to Rs 199,749, showing a tiny profit. The workshops utilised old and unserviceable materials for preparation of new stocks, and created material at a cheaper rate than in England. Recorded the Report:

> 'In order to utilise the large number of old half-iron standards with wooden tops, the galvanised iron top pieces 6 feet in length and bottom pieces 3 feet long have been successfully manufactured. By this means a large number of very strong good supports were made available at a time when they were much required. The height above the ground is 15 feet and breaking strain over 7 cwt., and the cost of new top and bottom pieces is Rs 8-14-6. For the converted half-iron standard referred to above, new sockets were required and the opportunity was taken to utilise a quantity of old iron in store at Calcutta and to cast them there. This was done very successfully, and at a lower rate than is paid for those received from England. A large number of sole plates and iron caps required for the standards erected during the year were also cast in the storeyard. In carrying out these works much material that had been lying useless for years was utilised.'

It was an example of the proverbial Bania thrift.

ODD SCREWS AND MISSING PARTS

The following instruments were manufactured in the Workshops as early as 1871: Battery testers, alarm bells, commutators, discharging apparatus for neutralising electric charge on long lines, tangent galvanometer, detector galvanometer, portable testing instruments, Morse sounders, training school instruments (sounders), insulators and joint detectors. The last one was an invention of the Electric Superintendent, Mr Schwendler, of the textbooks fame. Most of the stores at that time were being received from England and the Department wanted to reduce these imports so that the Workshop's manufacturing capacity and output could be increased. The principal items received from England were iron standards, insulators, and wires of various sizes.

According to a note written by Colonel D. G. Robinson, Director-General of Telegraphs, in November 1874, 'The chief object of the Workshops is to keep the Telegraph going. There is an immense amount of petty repairs and miscellaneous job works which vary in quantity with circumstances over which we have no control—such as cyclones—and in quality, from cable making for crossing large Indian rivers and high iron masts for air spans, to odd screws and missing parts required for the repair of some electrical instrument quite out of date. The Workshops compare favourably as regards their prices with private firms of Calcutta, but they would do better if they could only be kept supplied with a steady demand for heavy work of a uniform character. It is spasmodic and the every varying nature of the demands keeps the rates higher than they otherwise would be. For instance, there was an unexpected and sudden indent to supply famine offices, opened at very short notice, with instruments, batteries and lightning protectors, seats and tables, and other office fittings all of which had to be made up and at the same time another urgent indent was received from the State Railway Department for 100 instruments. This extraordinary supply was prepared and issued in time but only by working extra time, by great exertion and by employing extra hands, after which a reaction, a dull time, during which work to fairly employ the establishment had to be sought for, and was not found in sufficient quantities'.

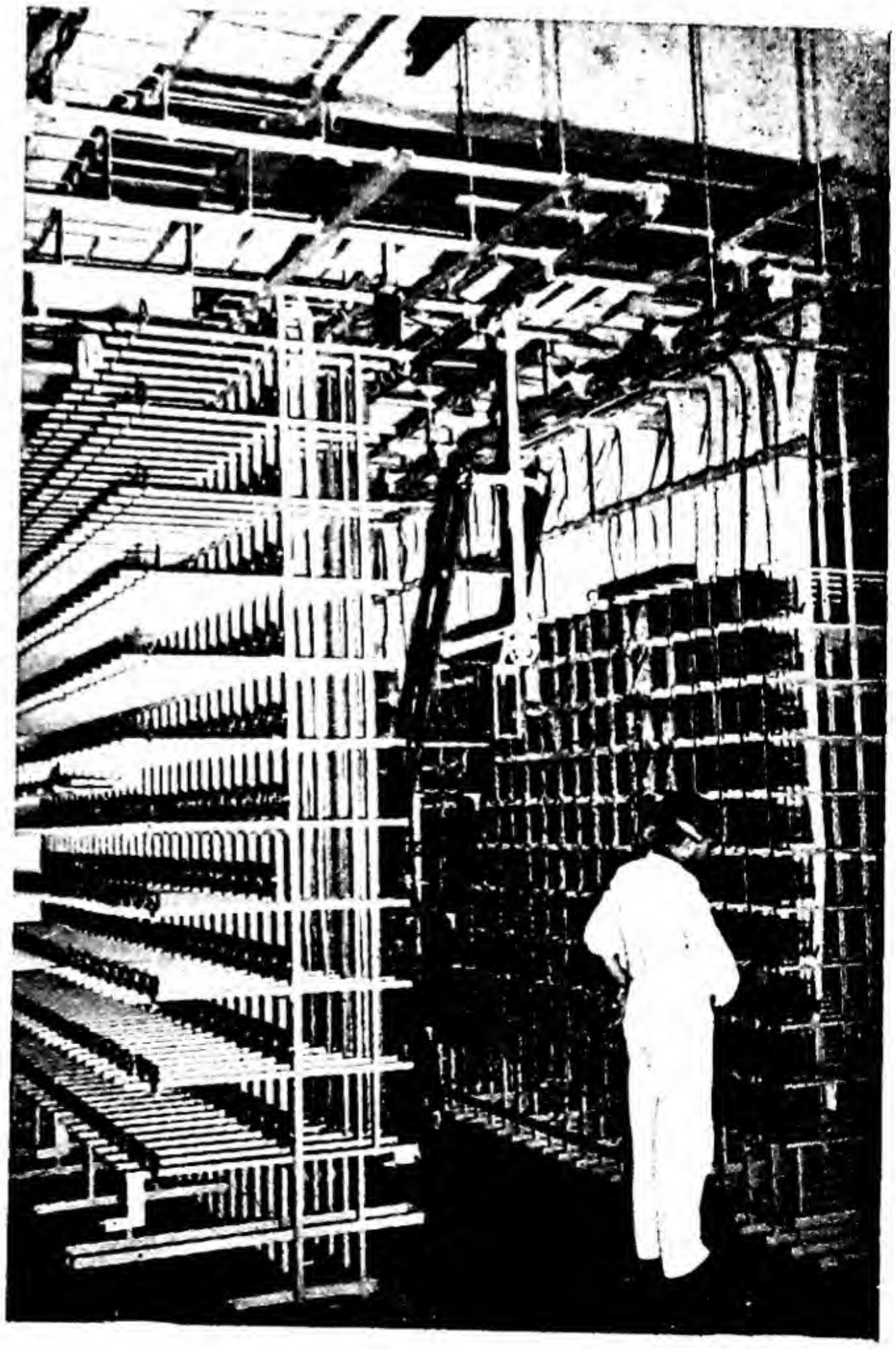
In 1875-76, the Stores Branch purchased the following under the various heads:—

Purchase of stores in India	Rs	156,259

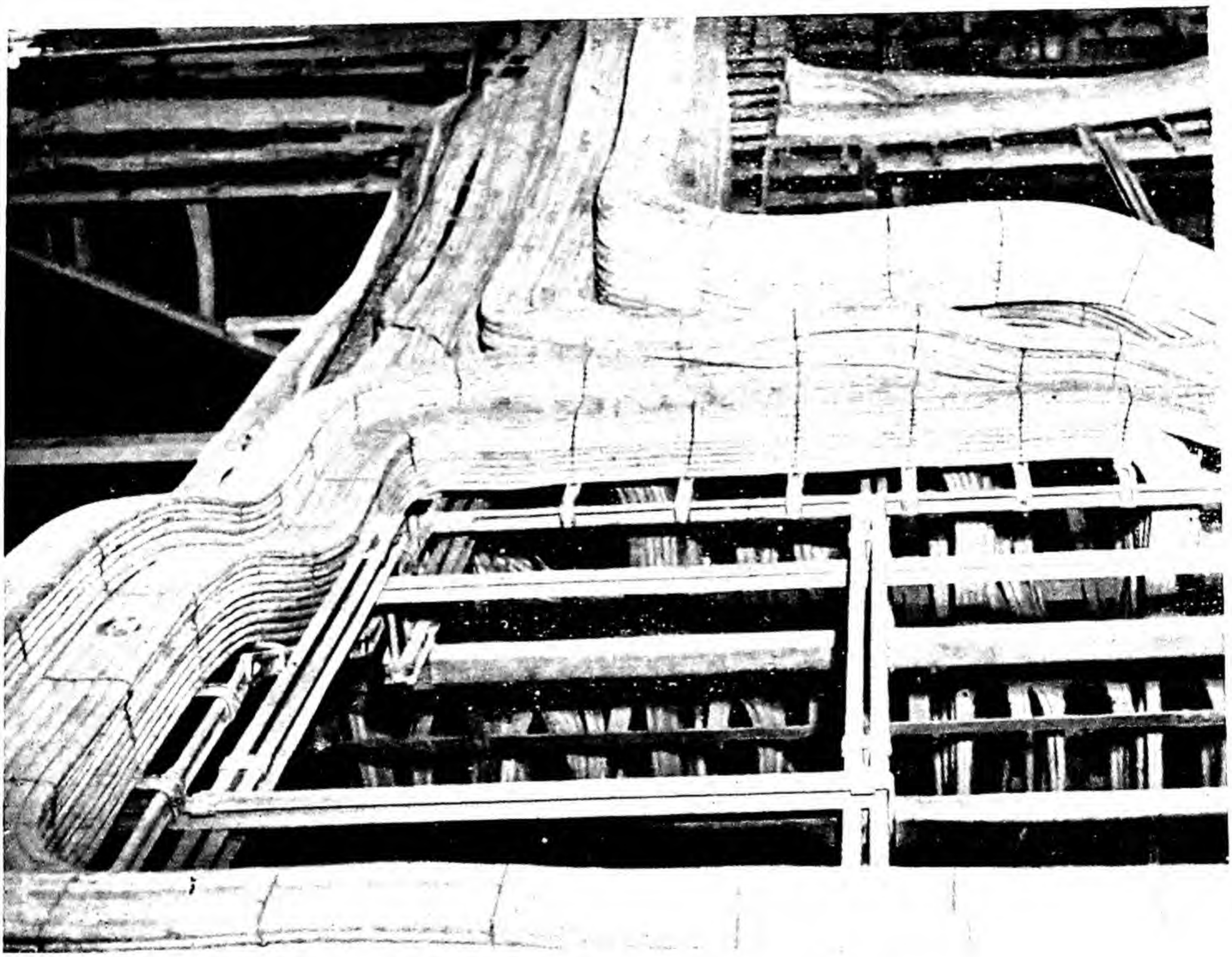
Shri R. A. Kidwai, first Minister for Communications after Independence

Shri Jagjivan Ram,
Minister for Communications

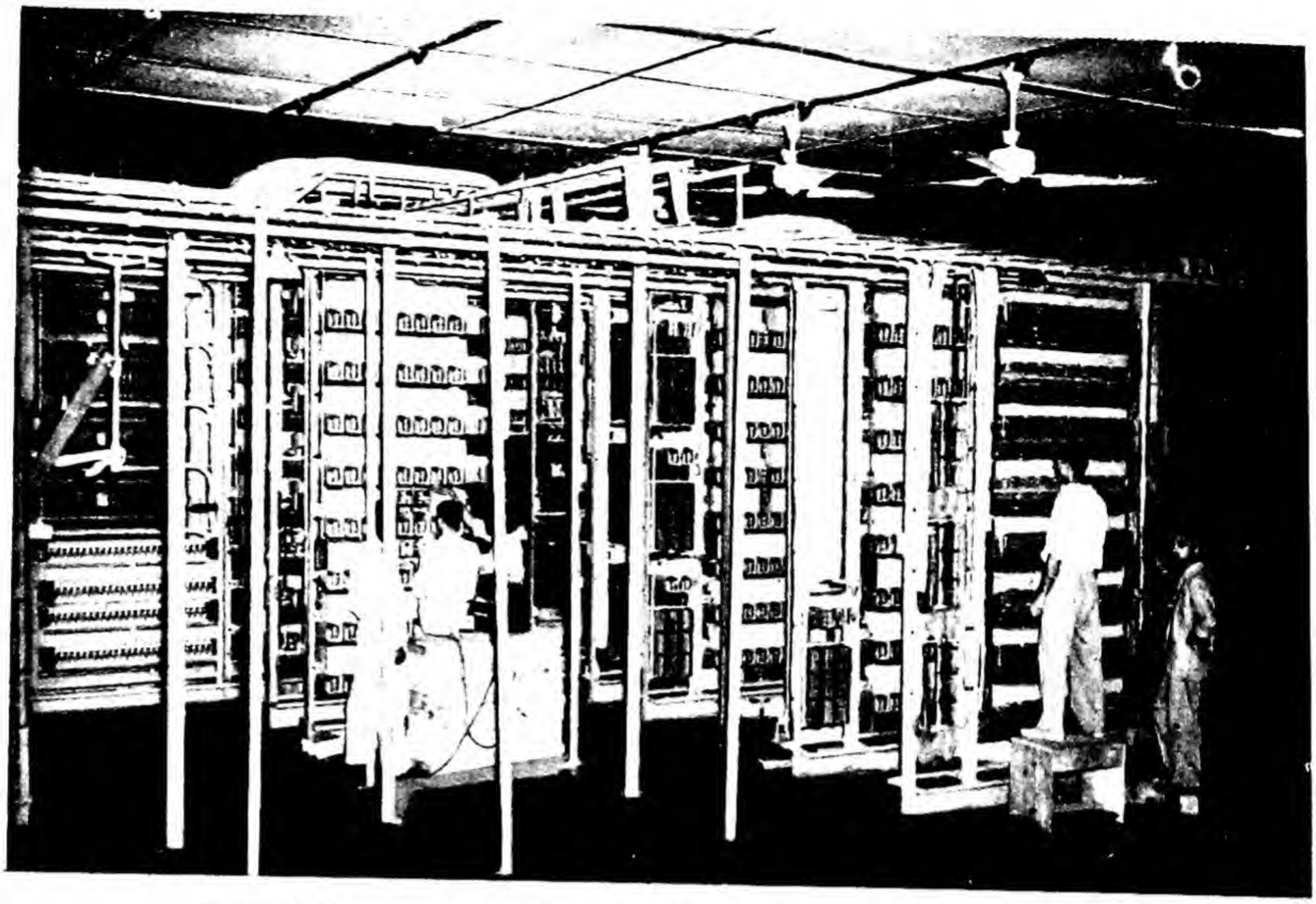
Telephone switches in an Automatic Exchange—the maintenance men are on the job



The Intermediate Distribution Frame

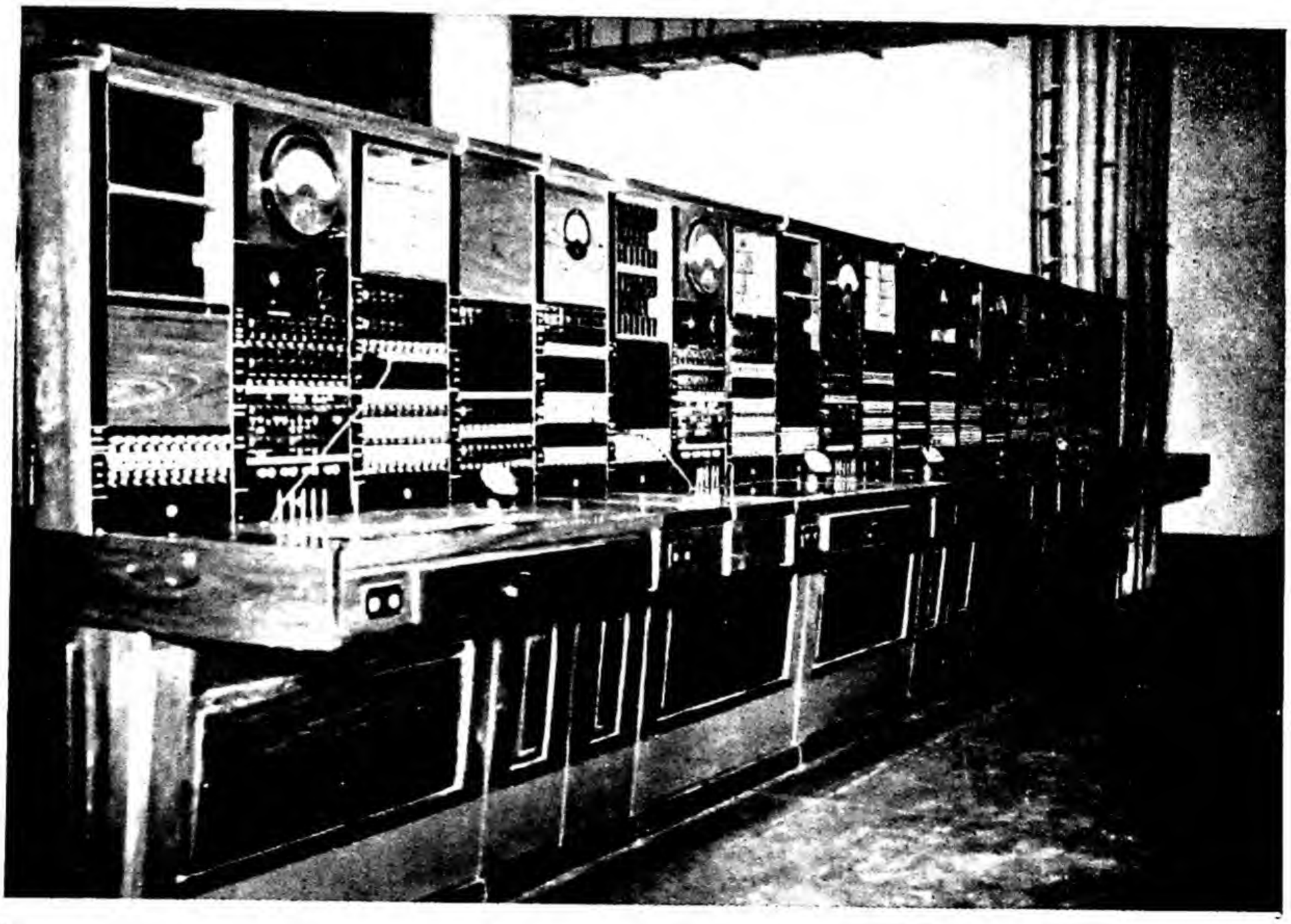


Close-up view of cabling in an Automatic Exchange



Test & Complaints—five-position suite under construction

Inside view of an Automatic Exchange under installation



British stores including freight and landing charges . .	Rs	634,992
Workshops and Press	Rs	164,066
Boats and Carts	Rs	585
Storekeeping	Rs	78,915
Stationery received from Supdt of Stationery without charge .	Rs	35,991
		1,070,808

The value of the output of the Workshops was Rs 269,546 and from the Press Rs 30,369. 300 tons of telegraph wires were purchased for the King of Burma, (payment of which was to be received afterwards) at a cost of Rs 95,327, and this was included in the above calculations.

By 1884, certain important changes took place in the Stores and Workshops organisation. The rapid expansion of the Department necessitated the separation of the Workshops from the Stores. This change resulted in economy and increased efficiency. Other changes during that year included the transfer of the maintenance of store accounts to the office of the Examiner, the partial assimilation of the account system to that adopted by State Railways, and the transfer of the Printing Plant to the contractor for Government Printing. At present, the Posts and Telegraphs has only two presses to print forms.

The policy of making use of articles locally manufactured in place of imported stores was continued and extended during this period. Considerable advance was made in the manufacture of telegraph plants both in the departmental Workshops as well as by private firms, and it was hoped that demands for English stores, other than tools and materials, would become considerably less as the local production gradually increased. Experiments were made with posts constructed of gas pipes. Two lines were constructed with this, and it was deemed an economical proposition for light branch lines. For other purposes, rail posts were supplied.

The endeavour to locally manufacture the standard pattern of tubular posts occupied the Calcutta Workshops. With the aid of local firms, they were able to supply to a great extent all indents on the Calcutta Depot. The total value of stores manufactured amounted to Rs 436,903.

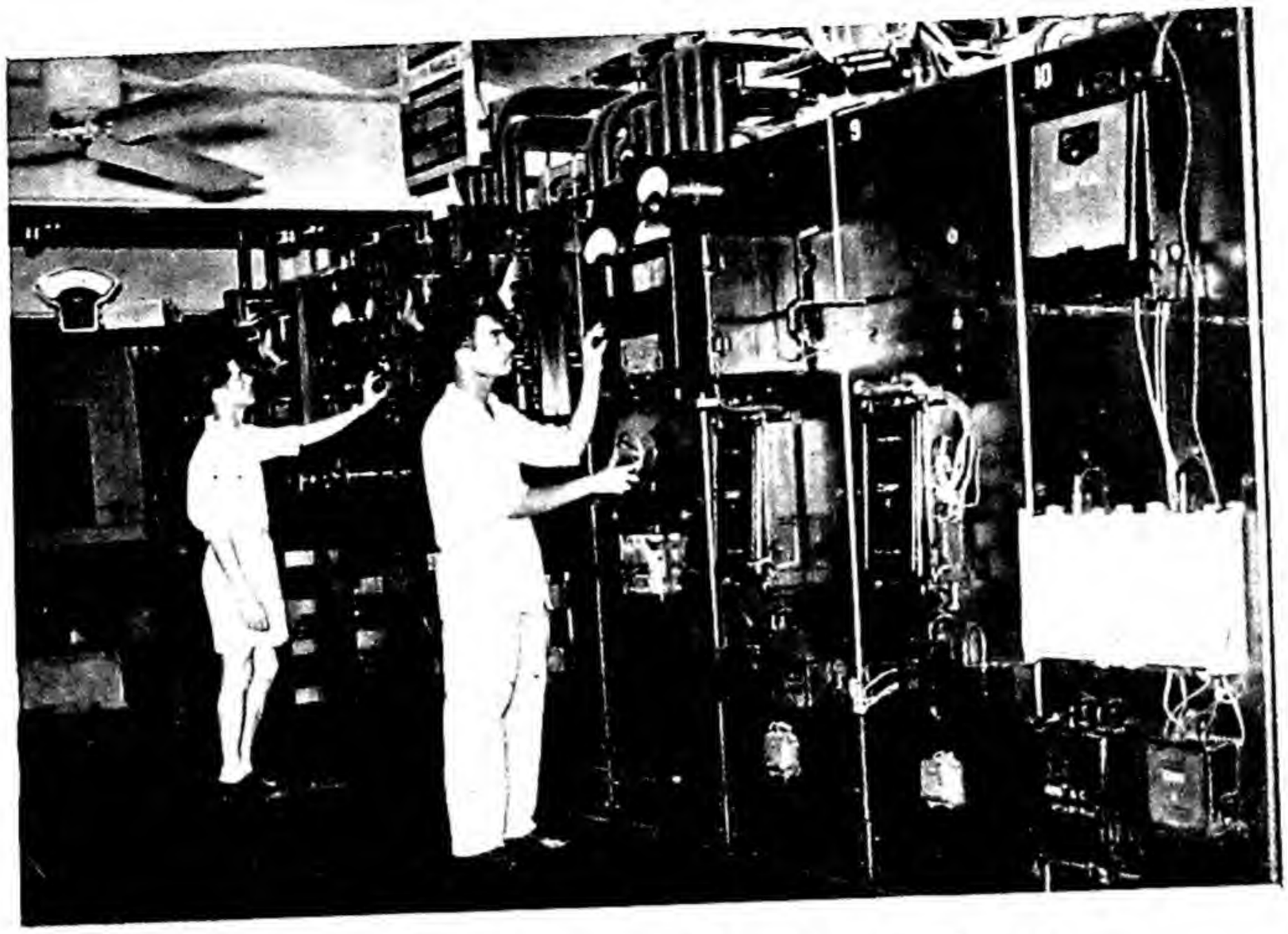
THE CHANGING EXCHANGE

In 1887, the Government ordered a revaluation of all the stores in stock at a rate inclusive of the losses in exchange values for such of the articles that were received from England. A new Rate List was prepared according to this order to show the real value of the Stores instead of their value in rupee at par. This corrected value was of considerable importance since stores were obtained sometimes locally and sometimes from England. Hence, the amount added to the value of stores on the books on 1st April, 1888 to cover the loss of exchange, was Rs 587,064. The juggling with the exchange rate by the British from time to time had enraged the Indian business community which believed that it was an indirect way of extracting money out of the country.

In 1890 iron and brass castings were made in the Workshops; about 417 and 415 of these castings weighing 5·6 tons and 5·9 tons respectively were turned out in one year. This was besides the usual instrument repairs job and repairs of electrical apparatus, which totalled 2,300 cases. In 1892, about 10·9 knots (12·55 miles) of submarine cable was turned out for the first time in India.

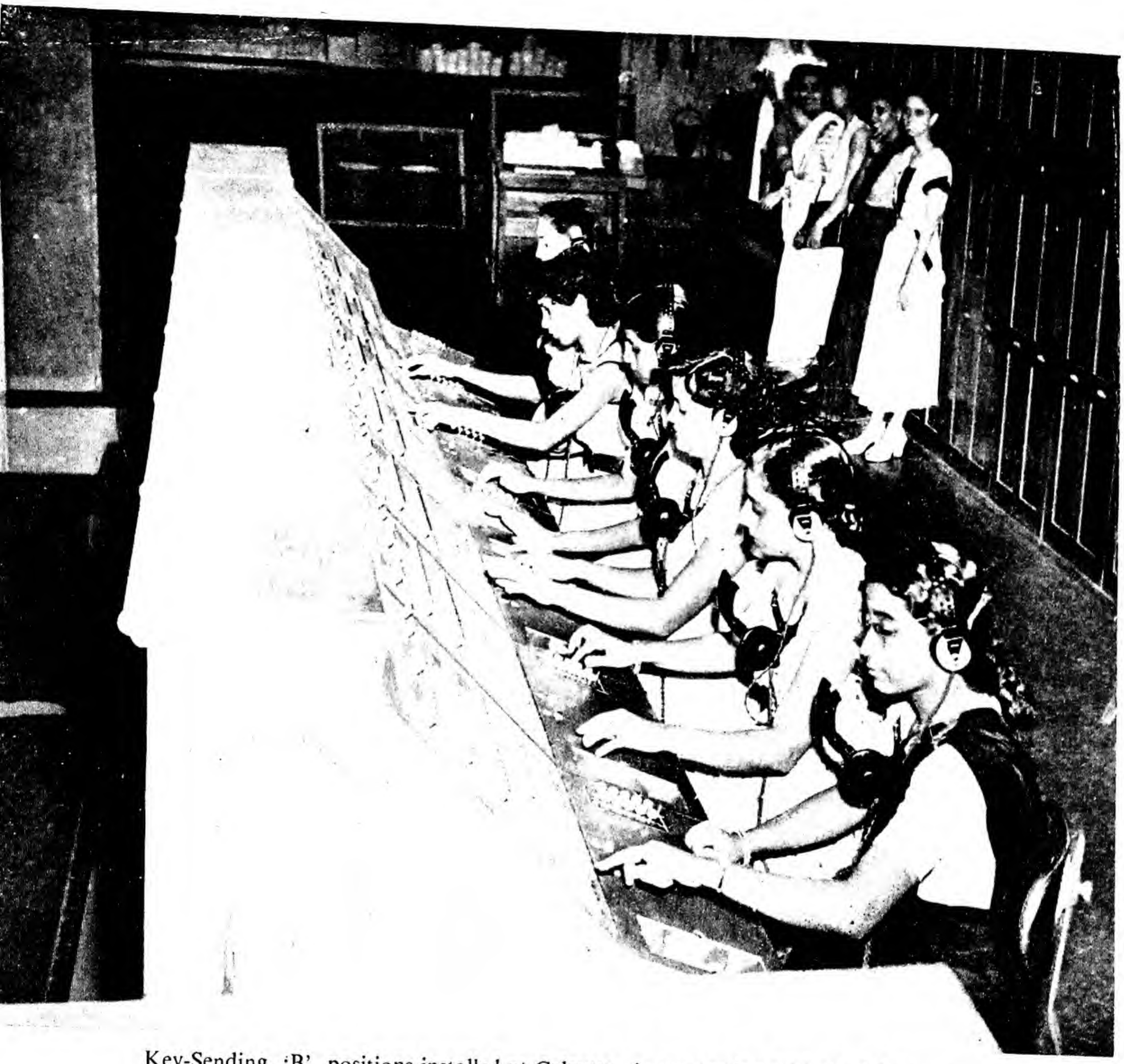
The number of packages imported and exported by the Stores Branch in 1899 was 362,693. The saving effected by the use of Government vessels for the carriage of stores was Rs 10,095; the weight of stores thus conveyed was 513 tons. A number of old rails was purchased from the sister service of Railways for use as posts or as components for the construction of masts for spans across rivers. The activities of the Workshops were expanded further during the year. A tarring shed was erected and flues constructed; root blowers were installed and additional furnaces built for the blacksmith's shop. A tramway between the Workshops and the Storeyard was constructed of old rails.

A notable success of 1899 was the drawing out of hexagonal brass wire for use in making nuts for screws. It was done by a foreman of the Workshops, who also found it advantageous to change the composition of the brass cast by addition of a small quantity of tin to make the alloy more suitable for fast turning. Magnets for the magneto-generators were at that time cut into lengths by machine and stamped in the shop by a die, instead of being forged, saving much labour and producing a better magnet.



Power control panels of a modern Exchange

Shri Jagjivan Ram, Minister for Communications, Government of India, performing the opening ceremony of the '24' Automatic Exchange at Calcutta on the 30th May, 1953. Dr. B. C. Roy, Chief Minister of Bengal, is on the right of the Minister for Communications



Key-Sending 'B' positions installed at Calcutta in connection with the 14 crores Automatisation Scheme. These positions are used for passing calls from Manual to Auto Exchanges

FURTHER EXPANSION

In 1900 the value of total production was Rs 769,272, the decrease from the previous year caused by the delayed arrival of iron stocks from England. The foundry topped all others in production, 1,320 tons costing Rs 152,929 being the main item. Attention was paid to reduce the cost of labour and to increase the output of machines by making supply tools and parts in large numbers for stocking. By this means, cost of labour on many articles was reduced. A separate foreman was appointed to keep charge of the stores and supervise the miscellaneous labour working in the yard. The tramway of 2′ gauge was finally completed and it in many cases replaced labour. Manufacture of relays had also been going on for some time. The workshops turned out:

(1) Relay non-polarised 500 ohms costing 65.64 rupees 1
(2) Relay non-polarised for transformers 250 ohms costing 63.02 rupees 4
(3) Relay polarised for 250 ohms costing 65.12 rupees 4

In the year 1910, under the Re-organisation Scheme of Stores and Workshops, the Depots at Bombay, Karachi, Madras and Rangoon were made self-contained. Considerable economy in the distribution of stores resulted, and supply of orders became quicker. The value of the turnout of the Workshops during the year was Rs 932,000.

The Telegraph Department was awarded two Gold Medals in the United Provinces' Exhibition at Allahabad, one for 'The telegraph suspension bridge and construction of telegraph line' and the other for the 'show case of manufactured telegraph instrument and models'.

The Workshops had met the challenge of the War by turning out implements of fighting, and by 1920 they were ready to enter a busy and prosperous year. The value of works completed during the year was: (i) Construction Stores, Rs 20,22,600; (ii) Instrument Stores, Rs 22,00,000; and (iii) Instrument new, Rs 226,600. Instrument repaired, Rs 126,600 and other works Rs 509,700. The output had increased by about 50 per cent. over the previous years. The Instrument Branch gave special attention to the treatment of high speed telegraph apparatus. An expert instrument mechanic was employed; 13,701 instruments were repaired during 1920-21.

A review of the commercial efficiency of the Workshops was made by a comparison of the manufacturing costs with the prices which would have

to be paid by the Department for the same articles in the open market. The average manufacturing cost of castings being lower than the market price by Rs 5 per cwt., there was a net saving to the Department of Rs 169,709. Similarly, the average manufacturing costs of brackets being lower than the market price by Rs 77 per hundred brackets, the net saving on the year's output amounted to Rs 155,000. Tube Sections had not been purchased for many years as the requirements of the whole Posts and Telegraphs were met in full by the Workshops.

A Store Depot was opened at Lahore in 1922 with a view to expediting the supply of stores to stations in northern India and for an efficient supervision of mobilisation stores on a crucial frontier. The Bombay store depot was transferred from its former site at Mazagaon to a new site at Sewri Reclamation, as the former was acquired for the extension of G.I.P. Railways. Considerable additions to the buildings for the storeyard at Calcutta and improvements for stacking and storing were accomplished. During the year, the Calcutta Workshops had a fairly satisfactory run and about 9,425 new instruments were manufactured, 12,803 instruments were repaired, and 142,706 galvanised tubes and 207,633 brackets for the Telegraph Construction Branch were made. The Iron Foundry melted 1,788 tons.

Prior to 1925, the Stores Branch had maintained a number of sub-depots at different places stocked with the principal items of all kinds, except instruments, to avoid delay in supply to remote areas. The main depot was in Calcutta. As a measure of economy and in appreciation of the modern transport facilities, sub-depots at Madras and Rangoon were closed. Small depots were, however, opened at these stations, and at Mandalay, to meet urgent requirements.

During 1926-27, the Balance Sheet of Stores was as under:—

	Rs
Opening Balance	1,25,34,819
Receipts	66,94,399
Issue	95,08,177
Closing Balance	97,21,041

In contradiction to previous experience, it was reported in 1925 that there was not much difference in the value of the Stores purchased and those manufactured in workshops. Stores and Workshops Section of the Audit Office was transferred to the Storeyard in order to facilitate accounting. The

appointment of a committee to deal specifically with the large balance of obsolete and unserviceable material clogging the yard was approved by the Government. The committee disposed of Stores to the value of Rs 416,143. A check system was introduced for instruments sent for test, so that the store branch could readily ascertain the actual number of instruments under repair or test.

The Surplus Stores Committee's labours turned India into an exporter country. It effected a reduction of Rs 383,868 in the value of the stocks. Issue of stores to foreign telegraph administrations and to the Army were as follows:—

	In thousand Rs
Civil Administration, Iraq	17,524
Indo-European Telegraph Department	602
Tibetan Government	1,018
Army, including arsenals	9,014

During the early part of 1930, when trade depression set in, the activities of the Telegraph Workshops were also affected and no new developments could take place. The output of the Workshop dwindled. By 1939, the stores transactions amounted to:—

	Rs
Total value of Stores purchased in India	368,398
Purchase made from firms not established in India	12,686
Closing Balance (including the stores maintained for possible military requirements valued at approximately Rs 20,66,600)	51,51,000

The Telegraph Workshops gave the following output during the same year:—

Construction Stores	114,000
Instruments (new)	412,000
Instruments repaired	178,000
Other Works	224,000
TOTAL	19 88,000

Raw materials from outside became scarce due to World War II. The question of using indigenous products more extensively was explored.

Success was achieved even in the early stages. To meet its own requirements as well as urgent demands from the military authorities, the Department took steps to raise the authorised general stock balance of stores from Rs 21,00,000 to Rs 34,00,000. Further, the Telegraph Workshops began to assist in the manufacture of munitions. The original Agra shop had become the Calcutta Workshop by 1870. Its being alone was threatened by the war with Japan. Workshops were started at Jabalpur to supplement Calcutta. The Bombay Workshop which belonged to the defunct Bombay Telephone Coy. and was taken over by Posts and Telegraphs in 1943 was expanded to manufacture certain items like Telephone Switch-boards, transferred there from Caloutta. Let us look at the two new ones one by one, as the story of Calcutta, later known as Alipore, is implicit in the account so far.

THE BOMBAY TELEPHONE WORKSHOP

Originally, the Bombay Telephone Workshops belonged to the Bombay Telephone Company. During early part of the World War II, before the Bombay Telephone System was taken over by the Government, these Workshops were doing a large amount of war work.

In the later part of 1941, a serious shortage of telegraph cords of all kinds was felt due to the import difficulties ; foreign companies were unable to supply the cords or to undertake their manufacture. The work of making cords from indigenous articles began. With the exception of certain wire drawing and tinsel testing plants, which could be purchased from foreign markets, the whole cord-making machinery was designed and manufactured at the Telephone Workshops, Bombay. Due to lack of facilities, the question of rubberising the cord was carried out by an outside agency, even though some progress was made locally in designing a rubber extruding machine.

The Bombay Workshops manufactured even Air Raid Precaution equipment, and a 5 horse-power Air Raid Siren. The apparatus for A.R.P. equipment in Bombay, Madras, Poona, Ahmedabad, Deolali and Karachi, including the Police Broadcasting system at Bombay, was designed and manufactured by the Workshop.

The Workshop passed from private hands to the Government in 1943. The entire supply of Trunk Exchange installations during war years, about 400 positions, was handled by the Workshop, and it was to its credit that

the first T-43 Trunk Board with 10 positions switchboards was manufactured by it and later installed at General Headquarters, New Delhi. This was brought into service during November, 1944, and gave a good account of itself. Even today, 90 per cent of India's needs in the field are met by national Workshops. Post Office Type Relays, Switchboard Keys, Jack Strips, and Magneto-Generators, which were required for all the Trunk and Manual Switchboards, were, for the first time in India, manufactured in the Workshop. The machines required were not available for purchase, and so the manufacture of these machines was also undertaken locally. Number of capstan lathes, centre lathes, guillotine shears, two-ton power presses, drilling machines of five spindle capacity, etc., along with form tools, milling cutters, slotting cutters, taps, dies, etc., formed part of the main schedule.

By 1943, the Workshop was supplying cable runways, tie-bars and other auxiliary iron work, as well as charging panels including open type racking to Bombay Telephone system at Ahmedabad and Karachi. After the World War II, and in 1947, the post-war development scheme continued, and the Bombay Telephone Workshop supplied iron-work for the Posts and Telegraphs as a whole and specially for the Calcutta Auto Expansion Scheme. The installation of Central Battery Exchange at 8, Hare Street, was done largely by the staff of this Workshop. At present the Bombay Telephone Workshop is concentrating on the manufacture of Manual and Trunk Boards, P.B.X., switchboards of various patterns, coin collecting boxes and other associated telephone components, besides repairs to all types of telephone instruments. Power switchboards and battery charging equipment are additional accomplishments. It is gratifying to note that this originally small Workshop at Bombay, having expanded enormously during the war years, is now contributing in a large way to the Posts and Telegraphs programme of the 15-year expansion.

THE JABALPUR TELEGRAPH WORKSHOP

World War II brought the Japanese close to the Indian soil, within easy bombing distance not only of Calcutta but also of the industrial core at Jamshedpur. The question of moving certain sections of the Alipore Workshops from Calcutta to a remote region was considered primarily from the point of view of security. It was also desired that there should be a duplicate of the Alipore Workshop, the main and only one so far for the Posts and

Telegraphs in India for the manufacture of Telephone and Telegraph materials. The scheme was approved, and the Telegraph Workshops in Jabalpur came into existence in April, 1942.

It stands on a site of approximately 72 acres costing over Rs 750,000. The plant and machinery initially obtained were valued at about Rs 200,000. This at present has risen to Rs 19,00,000. The factory started with hardly 300 men and these were mostly deputed from Alipore Workshops. The peak of the labour strength was in 1942-45, during the war years, reaching a height of 2,650 hands. This Workshop supplied construction materials and instruments. The Instrument Branch manufactured Telephone H.M.T. pattern, Intercommunication Switches, plugs, etc. The Construction Branch manufactured various tubes, brackets, U backs, straining screws, stalks bolts, nuts, etc. The value of annual production stands at Rs 55,00,000. The erection of a large Iron Foundry began in 1952.

The Workshop Re-organisation Scheme was started in 1949. An eminent American Engineer, Dr S. Trone, who had been invited by the Government, visited the Workshops at Alipore, Jabalpur and Bombay. Subsequently, the Government instituted a Committee under the Chairmanship of the Chief Engineer of Posts and Telegraphs to report on specific points. This Committee submitted its findings in 1950. Accordingly, a Board of Management for the administration and control of all the three Workshops, with headquarters at Calcutta, was set up.

Stores transaction during 1951-52 opened with a balance of Rs 5,33,51,991 and closed with Rs 4,80,66,275; the receipt and issue being Rs 5,59,38,291 and Rs 6,12,24,007 respectively. The value of stores purchased in India during the year was Rs 2,77,41,668 and the value of stores purchased in England Rs 159,795. The total output of the Workshops at Alipore and Jabalpur and Bombay were Rs 1,39,30,745 and Rs 91,98,331 respectively, bringing the grand total to Rs 23·1 millions.

XVI. Onward To 1956

EXPANSION AND MODERNISATION are the slogans of Posts and Telegraphs' Five-Year Plan from 1951 to 1956. The United States of America is a cohesive country and strong because pioneers marched with telegraph poles while pushing back the frontier. In the development of Israel communication lines and roads received priority over everything else. The allotment of Rs 48 crores is earmarked, entirely, for capital outlay. The objectives of the development plan include the opening of a post office in every village of 2,000 or more, or in a compact group of villages. More germane to our account, they include the opening of a telegraph office in every town of 5,000 or more, and in every sub-divisional headquarters irrespective of its size. Every district headquarters and every town of 30,000 or more will have a Telephone Exchange by 1956. And trunk facilities will be extended to every sub-divisional headquarters as well as to every town boasting a population of 20,000 or more. Telephone Exchanges are to be increased first to meet the existing demand and second to keep pace with new demands from the public. Last but not the least, the welfare of the worker is a cardinal principle. Their working conditions will be improved, and a definite number of them will have government-provided roofs over their heads by the 1956.

Rs 75 crores were originally demanded in 1950 to bring the ambitious project to its fruition. To that estimate should be added the increased cost of labour and personnel and material. But the Planning Commission has allotted only Rs 48 crores. The expansion envisaged will be correspondingly curtailed, but the basic objectives will remain the same.

So far as the Telegraphs are concerned, the Five-Year Plan envisages the installation of more Voice Frequency Telegraph Systems with a view to

increase the number of outlets at a cost of Rs 50 lakhs and extension of telegraph facilities to 800 more stations at a cost of Rs 100 lakhs. In large cities Printer-gram Service will be introduced and the renting of Teleprinters encouraged. The mechanisation of Bombay Central Telegraph Office is expected to be completed by the middle of 1954 at a cost of Rs 21 lakhs. The Telex-Service, already introduced in Bombay, will be popularised, so that private subscribers can get into touch with each other directly over their Teleprinters.

THE FIVE-YEAR PLAN

So far as the Telephones are concerned automatisation of the Calcutta System is already in hand. The services in Bombay, Delhi, Madras, Kanpur, Ahmedabad, Poona, etc., are greatly to be expanded to meet the needs of those growing cities. The main expansion is to come in the country's telephone system, and it will include the automatisation of the Manual Exchanges at Lucknow, Patna, Jaipur, Ajmer, Gwalior and Coimbatore.

The expansion of the service in multiple and non-multiple exchanges will be about 6,000 and 2,500 lines a year respectively. Delhi and Calcutta and intermediate stations will be linked by underground cable at a cost of Rs 4,40 lakhs.

Carrier equipments designed to utilise fully the cables and overhead lines would be installed. Eighteen 12-channel systems, some of which will be capable of conversion to 60-channel systems later, and 100 single-channel systems will be installed.

It is proposed to instal high power wireless transmitters at Calcutta, Bombay, Madras and New Delhi, strengthen the coastal wireless stations and re-open the Rangoon Telephone Circuit. Very High Frequency wireless links will be established initially in Travancore-Cochin area (which has certain natural advantages) and Assam during the next two years. Provision has been made for putting the monitoring stations at Bangalore, Jabalpur, Calcutta, Delhi and Bombay on a proper footing. The expansion of the Wireless network will cost Rs 57 lakhs.

It has been decided to reorganise the working and functions of the Posts and Telegraphs factories to avoid duplication. The Jabalpur factory will manufacture only line-stores, the Alipore factory telegraph and electrical measuring instruments and certain telephone items, and the Bombay factory

only Manual Telephone Exchanges. A sum of Rs 83 lakhs will be spent on these projects and the output is expected to increase by about 30 per cent. The supply of automatic exchange equipment from the Indian Telephone Industries Factory commenced in 1952.

It has been arranged in collaboration with the Standard Telephone and Cable Co. of London to set up a Telephone cable factory at Chittaranjan. This factory will go into production in 1953. Negotiations are being carried on with certain manufacturers for the setting up of a Teleprinter factory. The proposal to utilise the available manufacturing capacity of private industrial concerns for the production of Telecommunications equipment is also under the consideration of the Department.

The administration recognises the need for establishing a Telecommunication Research Organisation. Initially it is proposed to set up the main centre in the National Physical Laboratory at Delhi and also small units in the Posts and Telegraphs Factories to deal with local problems of manufacture.

The building works include:

(1) expansion of accommodation in Bombay General Post Office at a cost of Rs 30 lakhs;
(2) a building at Bombay at a cost of Rs 45 lakhs to accommodate all Posts and Telegraphs offices other than the General Post Office;
(3) a building at Delhi to house the office of the Director General and other offices at a cost of Rs 50 lakhs and the extension of the Delhi Eastern Court building at a cost of Rs 3 lakhs;
(4) a new building for the office of the Post Master General, Madras, and Mount Road Post Office at a cost of Rs 17 lakhs; and
(5) a building for Howrah Head Office and R.M.S. Office at a cost of Rs 10 lakhs.

These projects leave a balance of Rs 49 lakhs for constructing buildings for all other requirements.

It is proposed to open four large training centres, one each at Hazaribagh, Baroda, Hyderabad and Bangalore. Expansion of the Jabalpur Training Centre aims at the training of about 90 per cent. of the higher technical staff by the end of 1953-54. It is proposed to start refresher courses for the Engineers in specialised subjects like Teleprinter

maintenance, etc. The facilities for training of Linemen at the headquarters of Engineering Divisions will be improved.

The question of improving the quality of uniforms, chapals, stationery, forms etc., is receiving attention.

The plan provides for staff colonies at the places shown below:

Place	No. of quarters
Ahmedabad	120
Bhubaneshwar	140
Bombay	300
Chandigarh	100
Delhi	700
Gauhati	40
Kanpur	100
Nagpur	40
Patna	100
Siliguri	96

FIVE YEAR PLAN

Proposals and their cost

Item	1951-52	1952-53	1953-54	1954-55	1955-56	(51-56) Total
	In lakhs of rupees					
Calcutta Automatisation Scheme	97	1,37	2,50	2,17	2,72	9,73
Bombay Auto Expansion and Replacement.	35	28	78	1,10	1,20	3,71
Tis Hazari (Delhi) Exchange	10	12	4	25	46	97
Bihar Coalfield Exchange	17	15	5	7	..	44
Ahmedabad Exchange	2	11	5	12	10	40
Madras 3,000 Lines Expansion	..	..	..	..	..	..
Nagpur 1,500 Lines Expansion	1	3	1	..	..	5
Bangalore Exchange Expansion	11	(—) 6	15	6	..	26

Item	1951-52	1952-53	1953-54	1954-55	1955-56	(51-56) Total
			In lakhs of rupees			
Travancore Exchanges .	2	..	..	..	..	2
Simla Exchange . .	1	..	..	..	..	1
Hyderabad Exchange .	22	2	39	7	..	70
Delhi Secretariat Exchange	..	..	5	20	7	32
Kanpur Exchange . .	..	..	1	2	41	44
Lucknow Exchange .	..	..	1	10	38	49
Expansion of other Auto Exchanges including buildings :— (Karol Bagh, Madras Central, Nagpur, Coimbatore, Gwalior, Jaipur, Amritsar, Asansol, Allahabad, Poona, etc.) . . .	5	5	11	50	1,10	1,81
Manual Exchanges .	91	99	80	90	1,40	5,00
Trunk Exchanges . .	3	8	10	10	10	41
Carrier Equipment . .	7	13	30	30	30	1,10
Bombay Thana Cable .	3	21	8	..	..	32
Telecom Circuits for Railways, Canals and Civil Aviation Department	27	22	20	18	22	1,09
Trunk Lines . . .	64	36	20	20	20	1,60
Telegraph Development .	18	16	30	34	36	1,34
Long Distance Trunk Cable . . .	..	..	60	200	180	440
Wireless net-work . .	1	10	30	7	9	57
Mechanisation of Post Offices . . .	..	..	2	12	16	30
Special Requirements .	..	..	45	46	77	1,68
Jabalpur Training Centre and Development Circle	3	4	4	3	4	18

Item	1951-52	1952-53	1933-54	1954-55	1955-56	(51-56) Total
	In lakhs of rupees					
Minor Works . .	1,05	1,02	1,30	1,30	1,46	6,13
Workshops . . .	2	6	10	27	38	83
Madras Circle Office Bldg	..	..	2	6	5	13
Quarters for P. & T. Staff . . .	10	19	39	29	37	1,34
Bombay C. T. O. Building	..	..	1	16	18	35
Bombay G. P. O. Building	..	..	1	12	12	25
Post Office Buildings .	12	32	50	49	61	2,04
TOTAL .	5,53	6,02	10,17	12,19	15,05	48,96

DEMOCRACY TO THE VILLAGER'S DOOR

Thus the Indian Posts and Telegraphs looks to the future with confidence. Half of the period allotted to the Five-Year Plan is already spent, and the record so far scores realistic lines under the word 'optimism'. The scope of expansion envisaged is indeed creditable for a country of limited resources like India. But it is the spirit that counts more. The average citizen, and not the tycoon, is at the centre of the plan. The projects of expansion and modernisation are blueprinted with him in mind, with a view to making his life as comfortable, happy and fruitful as possible. Freedom's final meaning is to be validated by his personal experience, and democracy should go to his door. That is why the Indian Posts and Telegraphs plans to take the carriers of democracy, the telegraph and telephone lines, to his door in the remote village by the end of 1956.

APPENDIX

IMPORTANT DATES AND EVENTS

5th November 1850	.	The first Experimental Electric Telegraph Line was started between Calcutta and Diamond Harbour.
October 1851	. .	The Line completed and opened for East India Company's traffic.

April 1852	. .	Dr O'Shaughnessy's report on successful working of the Experimental Line landed before the Bengal Government.
November 1853	. .	Construction started of 4,000 miles of telegraph lines connecting Calcutta and Peshawar in the north *via* Agra, Agra and Bombay through Sindwa Ghats, Bombay and Madras in the South as well as Ootacamund and Bangalore.
October 1854	. .	The first Telegraph Act enacted.
February 1855	. .	Electric Telegraph opened to Public Traffic.
1857	. .	The ' Mutiny '. 'Electric Telegraph saved India'-Dalhousie.
1858	. .	The first Indo-Ceylon cable laid.
January 1865	. .	First Indo-European telegraph communication effected.
1867	. .	A new cable laid between India and Ceylon.
1871	. .	International Telegraph Conference at Berne and Rome.
October 1872	. .	Interference to Telegraph Working by Magnetic Storm.
1873	. .	Duplex Telegraphy introduced in India between Bombay and Calcutta.
1873	. .	Indigenous manufacture of cables for river crossing by Telegraph Workshops, Alipore.
August 1875	. . .	The first Private Telephone line supplied by the Telegraph Department.
August 1877	. . .	Indian Telegraph Department erected telegraph line between Srinagar and Gilgit on behalf of the Maharaja of Kashmir.
1877-78	. .	For the first time (except the first year) the receipt of the Indian Telegraph Department exceeded the expenses, netting a surplus of Rs 182,128.
July 1880	. . .	I. T. D. transferred responsibility of the Ceylon Telegraph System and offices to the Ceylon Government.

November 1881	. .	Licences granted to Private Companies to operate Telephone Systems at Madras, Bombay, Rangoon, Calcutta.
30th January 1882	. .	Opening of a Telephone Exchange at Bombay.
October 1885	. .	Upper Burma Campaign—I. T. D. helps in providing communications for swift advance. Introduction of Quadruplex telegraphy and copper wire for transmission.
1886-87	. .	Copper wire for transmission between Bombay and Madras instead of iron wire.
1887	. .	Facilities afforded to Indian Meteorological Service for communicating 'Storm Signals' to all places.
1888	. .	Post Office and Telegraph Department combined as quasi-commercial departments.
January 1889	. .	Death of Dr O'Shaughnessy at Southern.
1892-95	. .	Construction and control of Telegraph System of Kashmir State by I. T. D.
1895-96	. .	Phonograms introduced for the first time at Bombay and Calcutta.
1902	. .	First Wireless Telegraph station established between Saugor Islands and Sandheads.
1903	. .	Field Telegraphs for Sikkim, Tibet.
1903	. .	Reorganisation of Superior Establishment in Telegraph. Departmental Wireless Telegraph introduced.
1904	. .	Wireless Telegraph introduced between Elephant Point and Amherst.
1905	. .	Control of Telegraph Department transferred from P. W. D. to Commerce and Industry Department, except for matters connected with Buildings and Electricity.
1906	. .	Baudot system introduced between Calcutta and Bombay, and Calcutta and Rangoon.
August 1907	. . .	Central Battery working of Telephones was first introduced in Cawnpore.

December 1907 . .	Women signallers employed for the first time.
1907-1908 .	Wireless Telegraph working between Diamond Islands and Port Blair were successful during the nights of cold weather.
1908 . .	Wheatstone working between London and Calcutta, Madras and Rangoon.
1909 . .	Wireless Telegraph Traffic was maintained with ships-at-sea from Calcutta stations at Diamond Island, Table Island, etc.
April 1910 . . .	Birth of Technical Branch as a separate organisation for dealing with the technical matters under Electrical Engineer-in-Chief.
December 1910 . .	Telegraph Department awarded a gold medal in the United Provinces Exhibition held at Allahabad.
1910-11 . .	Introduction of Circle Scheme in the department and decentralisation.
1912-14 . .	Amalgamation of Postal and Telegraph Departments under a single Director-General. Reversion of control of P. & T. again to P. W. D.
1913-14 . .	First Automatic Exchange at Simla with a capacity for 700 lines with 400 actual connections.
1914-18 . .	Production of war materials by Workshops.
April 1919 . . .	Lady operators employed in Simla Exchange.
1920 . .	Madras-Port Blair route for Wireless Telegraph opened.
May 1921 . . .	Recurrence of Magnetic Storm after a period of 50 years. Telegraph Traffic in South India interrupted.
August 1921 . . .	National Cash Registers introduced in Calcutta C. T. O. for the first time.
1921 . .	Continuous wave transmitters for wireless telegraphy replaces the spark transmitters.
1921 . .	Introduction of R. A. X. at Poona.
1922 . .	Department erected a line for Tibetan Government from Gyantse to Lhassa.
1923 . .	Long distance dialling (90 miles).

1923 . .	Long distance dialling (90 miles) introduced between Lahore and Lyallpur.
1923 . .	First Trunk Telephone Circuit in Burma established between Rangoon and Pegu.
1923-24 . .	152 questions relating to the Department were asked and answered in the Legislative Assembly.
1924 . .	Floods and cyclone interrupted Telegraph Traffic throughout India.
1st April 1925 . .	Accounts of the Department re-constituted on the basis of a full-fledged commercial unit.
1925-26 . .	Conversion of Delhi Manual System to Auto System.
23rd July 1927 . .	Radio-Telegraph started working between U. K. and India. The beam station at Kirkee and Dhond opened by Lord Irwin and greetings exchanged with the King of England.
May 1933 . . .	Radio-Telephone communications between England and India opened by India Radio and Cable Communication Co. Special Trunk Exchange was installed at Kirkee.
December 1936 . .	Indo-Burma Radio-Telephone Service started functioning between Madras and Rangoon.
1936-37 . .	Use of Trunk Lines for broadcasting programmes introduced.
1937 . .	Burma and Aden Telegraph Systems, which were a part of Indian Telegraph System, separated.
1937 . .	Deluxe Telegram with foreign countries introduced.
1938-39 . .	Construction of short wave and medium wave wireless telegraph receivers in a number of stations and direction finding stations at Gaya and Allahabad.
1940 . .	Introduction of 'Urgent Private Inland Trunk Calls'. Overseas Telephone Service temporarily suspended due to war conditions.
1942 . .	Bombay-Australian Wireless Telegraphic Service inaugurated.

February 1942	. .	Bombay-China Wireless Service inaugurated. Training Centre at Calcutta transferred to Jabalpur.
1943	. .	The Bombay Telephone Workshop was taken over by the I. T. D.
1943	. .	The Jabalpur Telegraph Workshop started.
1943	. .	The Bombay, Calcutta and Madras Telephone Systems were taken over by I. T. D.
1942-47	. .	Telecommunication Development Scheme came into operation. A Telecommunication Development Board was set up.
August 1944	. .	Bombay-New York Wireless Telegraph Service was commissioned into service.
September 1944	. .	Second civilian outlet to U. K., Delhi and London Wireless Telegraph Service inaugurated.
1947	. .	India was represented at the important Atlantic City International Radio Conference.
1947	. .	Direct Telephone link to Kashmir and Assam.
1948	. .	The late Sardar Patel launched *Jalaprabha* on Telephone Carrier Channel and Wireless.
1st June 1949	. .	Introduction of Hindi telegram in Devanagari script.
December 1949	. .	'Own Your Telephone' Scheme inaugurated.
1949	. .	Wireless Station commenced functioning at Srinagar.
1949-50	. .	State Merger Scheme ; the P. & T. gradually took over the respective state P. &. T. systems.
January 1950	. .	India-Afghanistan Wireless Telegraph Service inaugurated.
		Radio-Telephone Service between India and Nepal inaugurated.
May-June 1950	. .	Coastal Wireless Stations at Karwar, Ratnagiri and Mangalore started.
October 1950	. .	The Wireless Telephone Service between Indonesia and India openèd.
November 1950	. .	Private Priority Telegram introduced.

1950 . .	'Own Your Telephone Exchange' Scheme began to operate.
December 1950 . .	'Telegraph Wires (Unlawful possession) of 1950, Act was passed by Parliament.
March 1951 . . .	The First Asian Games held at Delhi was covered by a direct Radio-Telephoto Service between India and Japan. Innovation of Radio-Telephoto Service.
December 1951 . .	Launching of *S. S. Jalapushpa* of Scindia Steam Navigation Company at Vizagapatam by Shri N. V. Gadgil from Bombay through telegraph circuits.
	Wireless Telegraph link to Thailand.
June 1951 . . .	Wireless Telegraph link to Moscow.
July 1951 . . .	Wireless Telegraph and Telephone link to Egypt.
	First Toll Cable : Delhi-Ghaziabad.
September 1951 . .	Wireless Telegraph and Telephone link to Iceland.
March 1952 . . .	Wireless Telephone link to Iran.
August 1952 . . .	Wireless Telephone link to Japan.
1953 . .	First Automatic Exchange in Calcutta. Telex Service in Bombay.
	First 12-Channel Carrier Systems. Introduction of Frequency Modulation. Mechanisation of Telephone Revenue Accounting.

GIPD—L—12 Dir of Comms.—27-10-53—1,500